THE NATIONAL GEOGRAPHIC MAGAZINE

Vol. XIV MAY, 1903 No. 5

CONTENTS

	PAGE
THE UNITED STATES—LAND AND WATERS. BY CYRUS C. ADAMS. ILLUSTRATED	169
THE CONQUEST OF BUBONIC PLAGUE IN THE PHILIPPINES. ILLUSTRATED	185
IMPROVEMENTS IN THE CITY OF MANILA. ILLUSTRATED	195
AMERICAN DEVELOPMENT OF THE PHILIPPINES. ILLUSTRATED	197
BENGUET—THE GARDEN OF THE PHILIPPINES. ILLUSTRATED	203
THE BRITISH SOUTH POLAR EXPEDITION	210
THE WORK OF THE BUREAU OF FORESTRY	213
THE TRANS-CANADA RAILWAY	214
GEOGRAPHIC NOTES	215
GEOGRAPHIC LITERATURE	217

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WASHINGTON, D. C.

From a photograph taken by Mr Bailey Willis

Wapitus Lake and Dutch Miller Pass, Washington

"Our scenery from the White Mountains to the Pacific Coast Ranges may be included among our resources, as substantial a source of gain as the Alps of Switzerland, which bring into that country millions of dollars every year."

VOL. XIV, No. 5 WASHINGTON MAY, 1903

THE NATIONAL GEOGRAPHIC MAGAZINE

"THE UNITED STATES—LAND AND WATERS"*

BY CYRUS C. ADAMS,

AUTHOR OF "COMMERCIAL GEOGRAPHY," ETC., ETC.

MANY foreigners who cross our country are impressed by two facts: its vast extent and its very apparent sparsity of population away from a few great centers. We are among the most populous nations in the world but our domain south of Canada is so great that with all our 77,000,000 people we have an average density of population of only about twenty-eight to the square mile, in which respect we are comparable with Norway, one of the most thinly peopled countries of Europe. That part of Great Britain occupied by England is one of the most densely peopled regions in the world; but if England had only our density of population its inhabitants would number less than one-fourth the number in Greater London.

GREAT DENSITY OF POPULATION

We have really no conception derived from our experience at home of what great density of population means. Perhaps the following facts may give a vivid idea of it. If we were to crowd our 77,000,000 people into Texas and add to them 40,000,000 more we should have a density of population in that state comparable with that of the lower Yangtse valley and the great eastern plain of China between the Yangtse and the Hoang rivers. But human experience has recently recorded a still greater density of population than this, and the following is deduced from the census taken last year by the Chinese government and already accepted by statisticians as a fair approximation of the number of persons in China. If we were to place in Texas double the population of the United States, or, say, 150,000,000 persons, we should have in that state approximately the density of population that is to be found in the Shantung province. Our nation may never be called upon to confront

* An address before the National Geographic Society, February 10, 1903. This is the first of a series of articles on the United States which are to be published in the succeeding numbers of this Magazine.

the problems growing out of such a prodigious congestion of humanity as this; and these illustrations of great density of population are given here only to show one aspect of our enormous territory. China is not half so large as our country and its natural resources, area for area, are no greater than our own; so the 408,000,000 souls in China proper at least give emphasis to the thought that we have as yet scarcely began to scratch the surface of the capacity of this country to support many times its present number of inhabitants.

OUR DIVERSITY OF CLIMATE AND PRODUCTS

Another influence of our vast area is permanent, far-reaching and most significant. The United States extending from ocean to ocean reaching far into the north and far into the south, with vast areas only 1,000 feet or less above the sea and others of high altitude, has great variety of climatic conditions and therefore great diversity of products; so that we grow nearly all the commodities of the temperate and subtropical zones, and not a few products of the tropical zone. We raise the citrus fruits of the Mediterranean, the figs of Smyrna and the dates of the Persian Gulf. We find that we can grow the famous Sumatra tobacco which we still import to the amount of millions of dollars every year; that we can produce Egyptian cotton, and Egypt does not raise all that the world would like to consume of that unique and superior fiber. This diversity of products and our large mineral resources make the country practically self-sufficient. No nation can become self-sufficient unless it reaches across a continent and embraces a wide latitude like the Russian Empire, Australia and the United States. We really need to import very little except certain raw materials from the tropics which our own colonial possessions may some day supply.

SOME ADVANTAGES OF OUR GEOGRAPHIC POSITION

We may properly treat not only the vast extent of our country, but also its situation with respect to other nations as among the geographic elements that have helped our material development, which is the topic assigned to me. It is to our advantage that we are on the same side of the tropics with the nations that are the greatest buyers of the bread and meat stuffs and other commodities we have to sell. It is a great disadvantage to be compelled to carry perishable commodities across the tropics. India raises large quantities of wheat and Europe would have been glad, many years ago, to buy Indian wheat; but before the Suez Canal was built India could not export this breadstuff to Europe. Steamers could not carry the wheat because, to double the south end of Africa, they had to recoal at St. Helena or Cape Town and coal was very dear for it was brought from Europe 5,000 or 6,000 miles away; the cost of the trip was very high and wheat being a cheap and heavy commodity can never be transported far at high freight rates. Wheat often sells for sixty cents a bushel in Chicago, and unless rates are cheap it cannot be moved. Neither could sailing vessels carry the Indian crop because they moved slowly through the hot latitudes both of the Indian and Atlantic Oceans and by the time the long journey was over the deterioration of the grain rendered it almost unsuitable for flour. But when the Suez Canal was opened India could send her wheat to Europe by steam and the problem was solved.

Before the days of refrigeration meat could not be sent to markets across the tropics; but even with refrigeration it is a great disadvantage to be compelled to freeze meats solidly in order to insure their good condition upon reaching the consumer. There is much prejudice against frozen meats in some parts of Europe, particularly in Germany, but consumers there are willing to buy enor-

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mous quantities of our chilled meats, which, they assert, are superior in quality to the frozen article. We are not compelled to freeze our meats to send them to Europe but the consignments are placed on steamships in chilled rooms whose low but not freezing temperature keeps them in good condition. When we remember that our foreign meat trade is a very important element in our commerce we can realize the inestimable advantage of not being compelled to carry this commodity across the tropics.

The United States, as well as all the other greatest commercial nations, fronts on the Atlantic making that ocean the preëminent highway of sea trade. A few years ago, a patient and laborious German set himself the task of ascertaining approximately the amount of business activity on the Atlantic. After collecting many facts he reached the conclusion that there are always afloat on that ocean about 50,000 vessels of one sort or another and that its floating population is constantly about 300,000 human beings. The value of the Atlantic for sea trade is increased by the fact that most of the great navigable rivers belong to the Atlantic drainage basin. All the great rivers of Europe, except the Volga, of Africa, except the Zambesi, and of America south of Alaska are tributary to the Atlantic. The Yangtse of China is the only river of the first class and of great commercial importance that is tributary to the Pacific. The Indian Ocean finds feeders for its trade in the Menam, the Irawadi, the Ganges and the Indus; but the great rivers of northern Asia are frozen two-thirds of the year and empty into seas that are likely to be ice-choked at all seasons. We shall see a little later how wonderfully helpful are our rivers in contributing to our large share in the sea trade of the Atlantic.

HARBORS OF THE UNITED STATES

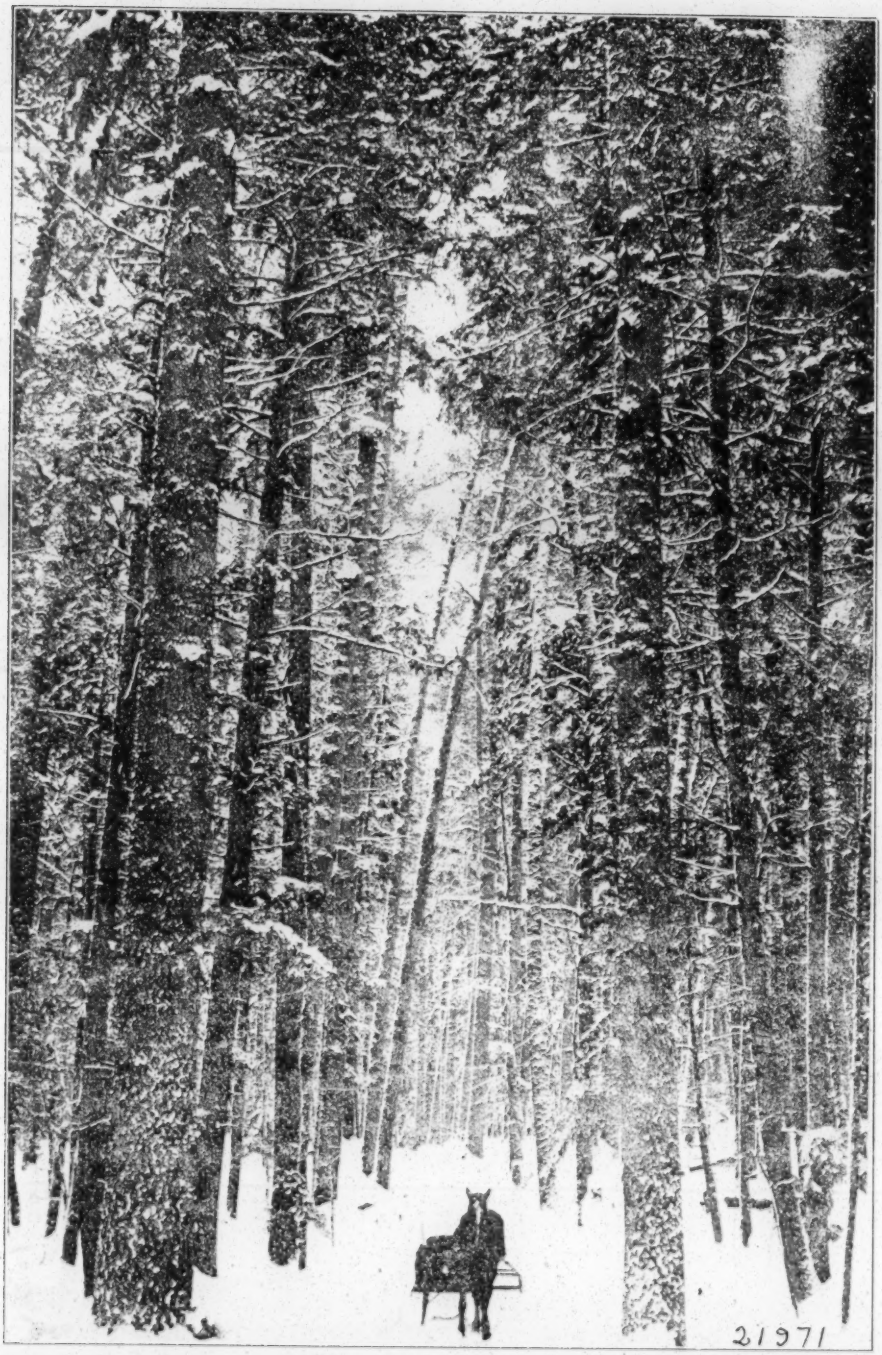
We are blessed with an abundance of good natural harbors to serve our commerce on this highway. Most of the largest and best of them are exactly where they may best serve our trade—on our northeast coast fronting the greatest commercial nations of Europe, with whom we have the largest dealings. On the whole, our harbors are naturally better than those of Europe; the result is that though nearly all harbors require large expenditure to fit them for shipping and to make good the deterioration that is constantly in progress, our disbursements for these purposes are not nearly so great as they are in Europe. Since the Coast and Geodetic Survey was organized New York Bay has been resurveyed five times to indicate the positions of needed improvements. The work of deepening and extending the channels of New York Harbor in progress for several years past may cost from $7,000,000 to $8,000,000 before it is completed; but Liverpool Harbor has cost, from first to last, over $200,000,000, more than half of which has been expended in the last forty-five years.

The great distinction between our leading seaports and those of Europe is that we have only to improve our natural harbors while the nations over the sea must make their great ports. Europe can show no ports like those of Puget Sound and San Francisco which will admit the largest vessels without deepening the channel; and our other largest ports may attain the same degree of efficiency at a total cost that seems small in comparison with the vast sums spent at Liverpool alone. London, Newcastle and Cardiff, as seaports, are largely artificial creations, the result of improvements made at enormous cost. The port of London extends from London Bridge to the mouth of the Thames but no vessel drawing more than 26 feet can ascend to London except at high tide; at other times large ships must stop at Tilbury Docks, 35 miles down the river. Glasgow deepened and widened the little ditch of the Clyde till

From Gilbert and Brigham's "Introduction to Physical Geography," D. Appleton & Co.

Among the Palmettos of Florida

The great diversity of our climate is well illustrated by the contrast of this and the succeeding picture



From U. S. Census Office

In the White Pine Forests of Michigan

it was transformed into a ship-floating river. All the Baltic ports of Germany are more or less obstructed by ice in winter, nor do her great North Sea ports always escape this inconvenience; for this reason Hamburg and Bremen require outports and Bremen must have an outport all the time because the larger vessels cannot ascend to the city. We have no port like that of Valparaiso, Chile—a splendid harbor save for the vital defect that the entrance from the sea is so wide that storms invade it and endanger shipping. We have no need for such a splendid example of engineering art as the great breakwater at Cherbourg which without this protection would be a dangerous roadstead. The North American seaboard shows no conspicuous example of the artificial harbor so common in other countries except at Vera Cruz which has just been turned by the labor of years into a good and commodious port.

TYPES OF HARBORS

Most of our Atlantic coast is low and presents all the prominent types of natural harbors. We know that large areas of the earth's surface are very slowly subjected to vertical movements, being uplifted above their former level or depressed beneath it; and that these movements are best observed along the margins of the sea. We speak, for example, of the uplifting of a part of the coast of Scandinavia, and of the sinking of the coast of New Jersey. In the course of the depression of the coast line the sea invades the valleys, widening and deepening them, and turning some of them into deep water harbors which are called Drowned Valley Harbors. When the sea burst over the barrier at the Golden Gate it turned the valley on which San Francisco stands into one of the finest drowned valley harbors in the world. New York is another example of a drowned valley harbor, which, wherever found, are among the best natural harbors. We see another form of the drowned valley harbor in the fiords of the Maine coast, long, narrow and deep, with this disadvantage that, when their entrances are funnel-shaped, the incoming tide rises very rapidly and high so that the difference between mean high and low tide in some of our Maine ports is as much as 20 feet which is an inconvenience to shipping. The difference between mean high and low tide at New York is only a little over 4 feet.

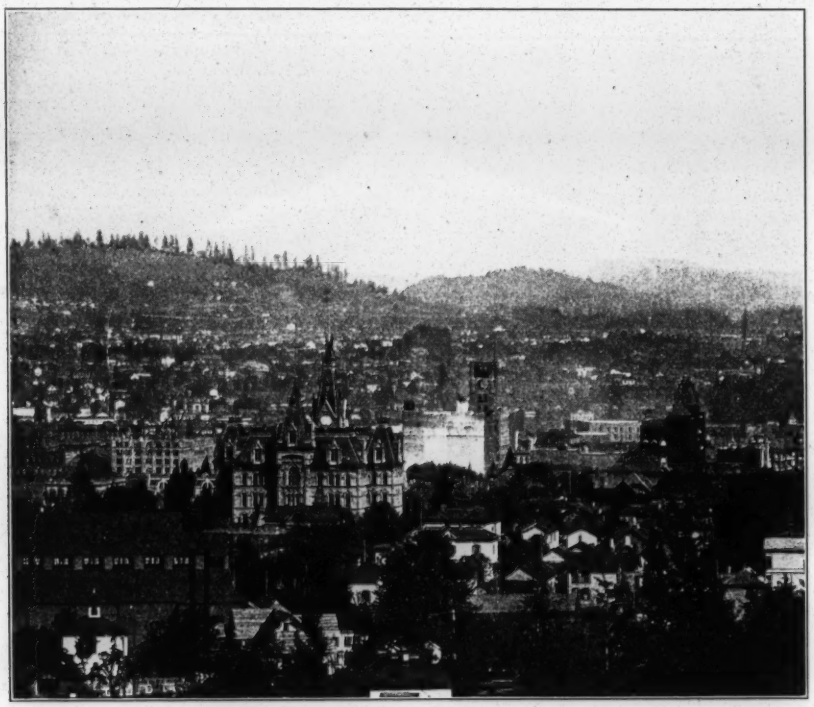
The barrier harbor is also well represented on our eastern seaboard; thus we may speak of Boston harbor as being protected from sea storms by the cluster of islands at its mouth; and of the numerous smaller ports of the south Atlantic coast as sheltered from the ocean by the sand reefs that extend brokenly along the front of our coast from Long Island to Florida.

River ports such as Philadelphia and New Orleans and ports at the head of deep embayments, as Baltimore, permit ocean vessels to penetrate a considerable distance into the land which is an advantage because ocean freights are cheaper than those of the land routes. Baltimore, 140 miles from the sea, is nearer to the Mississippi valley than is New York.

Our Pacific coast, unlike our eastern seaboard, is high and rocky and has only four fine harbor centers but they are so distributed as to serve adequately all the purposes of our Pacific trade. Puget Sound, one of the most useful of inlets, has scores of miles of shoreline along which the water is so deep that docks might be built anywhere for the largest vessels. The fine river port of Portland supplements the Puget Sound ports in the northern trade, San Francisco is the great central gateway of the Pacific commerce and San Diego, at the extreme southwestern corner of the country, with a landlocked harbor in which the government has been making great improvements, is nearest to

the cotton-fields and is becoming important in the shipment of raw cotton and cotton fabrics for the Oriental market.

When a steamship leaves Seattle in summer the crowded decks and docks resemble the busy and inspiring scene upon the departure of an Atlantic liner at New York. The fact that most of those passengers are not going to seek gold should convince us that it is time to count scenery among the important assets of the country. Every year increasing crowds are drawn to Alaska by the mighty glaciers, the rugged fiords, the snow mountains and the splendid, bracing air in that part of our domain. Among our western mountains men are now building hotels, making roads, cutting paths and procuring guides, so that scenery may be enjoyed to the best advantage and under comfortable circumstances. Our scenery, from the White Mountains to the Pacific coast ranges, may be included among our resources, as substantial a source of gain as the Alps of Switzerland which bring into that country millions of dollars every year.



From Geo. M. Weister

Portland, Oregon, Mt Hood in the Distance

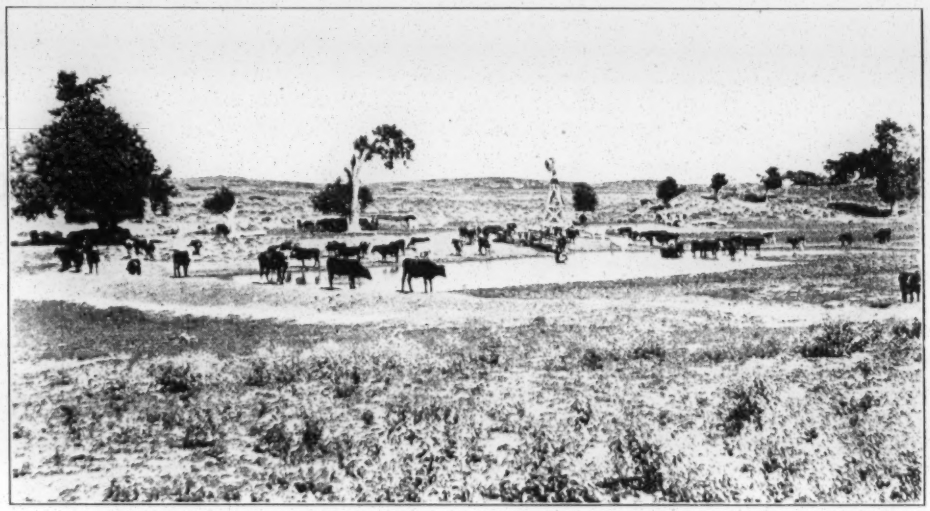
"Our Pacific coast, unlike our eastern seaboard, is high and rocky"

OUR COASTAL PLAINS

The United States, in the main, is a great central plain bordered on the east by mountains of no great elevation, and on the west by plateaus and mountains

of high elevation; with narrow eastern and broad southern coastal plains; with most of the rivers that are important in an economic sense confined to the eastern half of the country; and with inland seas providing the cheapest transportation known excepting on the oceans. All these topographic features have had a profound influence in distributing our industries and shaping our development.

large quantities of lumber and naval stores; and on the sea edge are the swamps which, when reclaimed, are extremely fertile. Where the softer plain joins the harder rocks of the Appalachian belt the rivers crossing from the harder to the more yielding rocks have made a line of waterfalls beside which many thriving towns and cities have been reared to use this power in manufacturing; and along these narrow belts



From Willard D. Johnson, U. S. Geological Survey

On the High Plains, Western Kansas

Large areas of our high plains are being reclaimed by artesian wells, which enable ranchmen to establish stock-watering points at comparatively close intervals

Probably no other coastal plain has so advantageous a position and so many elements that conduce to prosperity as the plain along our Atlantic seaboard. The waste brought down from the mountains on the west has contributed to its fertility and made it a meridional zone of fruits and vegetables, cereals and hay. At its western edge are the clays used in the development of the largest pottery industries of the country. Nearer the sea is the long sandy zone which, south of Virginia, supplies

of manifold resources and industries extend railroads easily built because they met few natural obstructions and leading straight to the great cities of the north that are the preëminent markets for most of these commodities.

THE GREAT VALLEY, PLAINS, AND PLATEAUS

The broader southern plain along the Gulf is a great region of the lumber industry with a product of nearly $2,000,000 a year, of agriculture and chiefly of

cotton-raising for this is a part of the great cotton belt. The plain merges with the Mississippi Valley which from our northern border to the Gulf is the preëminent agricultural zone of the country, the northern part of it, mantled with the fertile rock mixtures of the glacial drift, the richest area of wheat and maize in the world; the southern part, included in the cotton belt, which supplies nearly three-fourths of the world's cotton; and in the border lands between them a zone of tobacco cultivation, our largest area devoted to this crop.

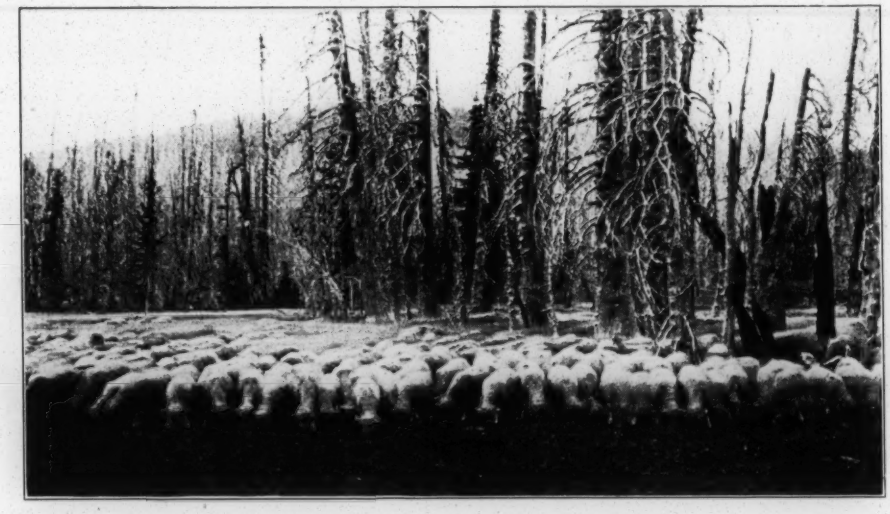
From Willard D. Johnson, U. S. Geological Survey

A Field of Watermelons, Western Kansas

West of the Great Valley the plains begin to rise midway between the two oceans. It is to be observed that the main axes of all our predominant topographic features extend north and south excepting the Great Lakes whose main axis is east and west. The plains extending from Canada to Mexico and gradually rising to the western plateaus are the largest field of the grazing industry which has long supplied most of our export beef though not our export cattle, the greater number of which are fattened in the corn belt. The plains have been much impaired by overgrazing and must be nursed back to their former productivity. Just as the nibbling sheep have destroyed all verdure on the mountains of Greece so they have been very effective in killing out much of the nutritious bunch and other grasses on the plains and among the mountain pastures farther west. The plains gradually rise till they merge with the Great Plateaus which embrace about a third of the country and with their surmounting mountains extend nearly to the Pacific. They are the largest sources of our precious metals in whose production we have for many years usually surpassed other nations.

UTILITY OF OUR MOUNTAINS

We must count mountains as among our greatest blessings. While our valleys and plains are the sources of most of the food for man and beast it is from the mountains that we derive a very large part of our metals and other minerals. If we had a great mountain wall stretching from east to west we might be shielded from the Arctic blasts that sweep down from the plains of Canada



From F. H. Newell, U. S. Geological Survey

A Band of About 2,000 Sheep Grazing on the Mountain Slopes of Oregon, About 6,000 Feet Above Sea-level

"Our mountains, though of little use for agriculture, provide a large amount of fine grazing land."

in winter and chill us to the bone. We know that northern India is thus protected by the Himalayas and northern Italy by the Alps so that the average winter temperature on the French and Italian Riviera is warmer than at Rome. It is questionable however whether such a climatic barrier would be of any advantage to us as a people for our diversity of climate tends to intensify stamina and energy. Our mountains are the largest sources of water power which is more valuable than ever now that electricity is used for the transmission of power. They add largely to our timber resources and though of little use for agriculture they provide a large amount of fine grazing land. Their rock waste is spread over the surrounding plains to their enrichment and they husband our water resources where they are most needed. It is among the mountains that reservoirs are to be built to conserve water from the melting snows and glaciers and advantageously distribute it over the regions to be irrigated which, it is estimated, may reclaim 50,000,000 acres to fertility.

Our mountains are partly responsible for the prevailing aridity of the plateau region for though the Pacific coast from Puget Sound to a little south of San Francisco has abundant precipitation the rain clouds are wrung nearly dry among the mountains so that there is little moisture left to distribute over the plains east of them; but nearly half of our Pacific coast to the south of San Francisco is in the zone of the northeast trade winds which girdle the world in the Northern Hemisphere, blowing most of the time as dry winds off the land instead of coming to the land as moist winds from the sea; so that even if there were no high mountains in the southern part of California the adjacent country

From M. A. Carleton, U. S. Department of Agriculture

Combined Harvester-Thresher on One of the Vast Wheat Fields of the West

would derive little rain from the Pacific. We are indebted to these southwestern Cordilleras for the fact that the rainfall they conserve may be led down to the California valleys turning them into areas of wonderful fertility, the great centers of our home production of semi-tropical and some other fruits. We remember the time when the "Great American Desert" was spread over most of the western part of our maps. It has now shrunk to very small proportions indeed; and the drier regions of the country will some day be eliminated as far as water can be obtained for their reclamation.

DISTRIBUTION OF RAINFALL

At least 20 inches of rainfall a year are required to make farming fairly profitable and this is a scanty supply. Nearly double that quantity falls in the half of the country lying east of the 100th meridian and along the northern three-fifths of the Pacific coast, and to these regions is confined nearly our entire development of agriculture excepting where stock is fed on the plains or crops are irrigated. The profound influence which this unequal distribution of rainfall has had upon our lordship over the domain committed to us is shown on many maps. A map showing our density of population usually leaves white most of the vast region west of the 100th parallel; a map showing the distribution of our swine industry shows its western frontier in central Nebraska, Kansas and Texas because we fatten hogs on maize which requires abundant moisture; a map illustrating cattle industries shows, the limit far to the west of the region of swine for cattle can thrive on grasses of the plains though we drive many of them into the corn belt to fatten. A map showing the

larger phases of our manufacturing development practically coincides with those colors on a density-of-population map showing forty or more inhabitants to a square mile. Naturally we have not developed large manufacturing in areas that average a fewer number of persons. If we look at a map of our irrigation centers we may see today a large number of them scattered over the plateau region. But those dots represent only small areas of irrigated land. Perhaps we shall never see the irrigation centers largelyincreased in number but many of the dots on the present maps will spread out into broad or long patches of color representing very important areas of reclaimed lands.

RIVER VALLEYS AS LINES OF DEVELOPMENT

River valleys have always facilitated the advance of man into the interior of the continents and for this reason the Nile, the Euphrates, the Ganges and other great rivers are spoken of as the creators of history. Exploration is usually retarded wherever physical obstacles make it very difficult to ascend the rivers, such as the rapids of the Mekong and the Congo; the latter river was known less than 200 miles from its mouth until Stanley launched his boats on the upper river and floated down the stream. Our rivers also have been the creators of history. Just as the Jesuit Fathers paddled their canoes up the St. Lawrence and the Ottawa, carried them across portages to rivers leading to the Great Lakes, followed up the western tributaries of Lake Michigan and finally pushed their little craft into the current of the Mississippi, so our forefathers used the rivers and lakes to push their hamlets and their farm lands inland; and reaching out on both sides of the waterways they found new opportunities for settlement and enterprise. The old Dutch burghers lined the Hudson with their farms and villages. In the course of time the settlements spread farther and farther from the river edge. The pioneers, for example, pushed up on the great limestone plateau of the Catskills to see what they might find. They discovered fine forests of hemlock and the day came when immigrants from Connecticut and other regions went to the Catskills for the primary purpose of using hemlock bark to turn into leather the hides produced by farmers. As the population of the valley steadily increased it was certain that a town would rise at the head of navigation on the Hudson; for wherever an important amount of transshipment of freight between land and water is made there must be freight handlers, blacksmith shops, living accommodations, and fodder and shelter for animals; a town is sure to rise at such a place and thus Albany and Troy were founded at the head of navigation. The valley of the Mohawk was discovered opening an easy route of penetration to the west. The gradually growing stream of immigrants pushed westward clearing farms and founding settlements along the Mohawk; following up a little tributary of the river some of them made their way into the forests of Fulton county where, finding plenty of deer, they began to dress buckskin and make gloves for which they found a ready market. The farmers' wives and daughters took up the industry in increasing numbers and finally skilled labor from Europe came over and taught better methods of glove-making; so the industry grew until today we have Gloversville and the towns around it, the greatest centers of glove-making in the country.

Entering the Onondaga valley from the Mohawk the pioneers found the salt springs of Syracuse, long the largest source of salt in the country; Oswego on lake Ontario is one of the oldest settlements in New York because the early farmers found along the Oswego river a natural route of penetration from Syra-

From "Commercial Geography," by Cyrus C. Adams. D. Appleton & Co.

On the basis of three feet as the minimum depth of navigability, the rivers of the United States afford over 14,000 miles of navigation, measured in straight lines, and much more following the sinuosities of the streams.

cuse to the lake. Farther west they came to the Genesee river which they followed scores of miles to the south making its valley, for many years, the largest region of wheat in the country; so they pushed steadily westward opening farms and planting towns along the lakes and the rivers flowing into them.

The facts of nature pointed unmistakably to the appropriate sites for towns. As the pioneers floated down the Ohio they came to the great bend of the river where it changes its course from northwest to southwest. When settlement spread away from the river not all the freight floated down the stream was destined for places farther southwest. There were towns to the northwest to be supplied and transshipment of freight to land routes was necessary; at this place of transshipment the city of Cincinnati arose. Still farther down the Ohio the river was impeded by rapids making another transshipment of freight necessary and this fact resulted in the city of Louisville.

If we were to trace the history of our entire material progress we should find that the waterways of the eastern half of the country have been the main factors in determining the lines of development. Those persons who were able to interpret the meaning of the natural facts presented for their study have reaped large rewards. A young farmer started from St. Paul one day on a little steamer that was to be pushed as far up the Minnesota River as possible. He was

looking for some very desirable preëmption claim on which to begin farming. When the steamer finally stuck in the mud he said to himself: "It is right here that I want my 160 acres." He filed his claim and farmed the land till he sold it about ten years later for $25,000 to be divided into lots for the town of St. Peter which was rising at the head of navigation.

No great country, however extensive its railroad facilities may be, can afford to neglect its water highways. Notwithstanding our river and harbor bills and our Mississippi Commission we know little as yet of the scientific development of waterways for commercial purposes as it is understood in all the countries of northwestern and north-central Europe where boats freighted on the Vistula in Russia may reach, through rivers and canals, all the leading ports of the Baltic and North Seas. Increasing density of population and towns and cities more thickly scattered over our domain will impress us, as Europe has been impressed, with the absolute necessity of supplementing our railroads with the fullest possible development of our water routes. In the past few years we have seen the Mississippi transforming New Orleans into one of the great wheat ports as well as the greatest cotton port of the world. We see the Ohio and the Mississippi carrying coal, iron and lumber 2,000 miles at a cost very little in excess of ocean freights; and though the Erie Canal, which provides the port of New York with a continuous waterway to Duluth is antiquated and inadequate, it has made the Hudson River, with its 18,000,000 tons of freight a year, the largest commerce carrier among the rivers of America; it was the leading factor in giving to New York a commercial movement nearly equal to that of London. We have witnessed the development of our marine on the Great Lakes where marvelously cheap freights have helped us to compete with the world in iron and steel goods though we carry most of our iron ore nearly 1,000 miles to the coke and limestone required to smelt it.

OUR TOPOGRAPHY FACILITATED RAILROAD DEVELOPMENT

A country as vast as ours and with as small a density of population could not so early have attained its present development if our enormous system of communications had not afforded the lowest land freight routes in the world. A good topographic map shows us that the topography of the country was very favorable for the building of the vast systems of railroads whose mileage, extending to the neighborhood of most of our farms, would stretch nearly from the earth to the moon. There are gateways through our mountain ranges so that none of them is a barrier to commerce. We have no obstacle like the Pyrenees which so completely walls France from Spain that the land traffic between them must be deflected from straight lines to circumvent the extreme ends of the mountains at the edge of the seas. The comparatively level surface of our plains and plateaus, the predominating easy gradients and the mountain passes have helped to cheapen railroad construction and transportation so that commodities may be cheaply moved. Argentina raises its export wheat within fifty miles of tidewater. We send our export wheat 1,000 miles to tidewater but the price of freight has been so cheap that we are able to compete with any nation in the world in exporting this commodity.

What a reservoir for future harvests of breadstuffs is our hard wheat region of Minnesota and the Dakotas, a part of the central plain of North America that is twice as large as Great Britain and Ireland or as New York and New England together, and larger than the German Empire. These three states are producing much more than one-half

of the spring wheat of the country and we know that their capacity for production may be more than doubled. The Canadian northwest is boasting that its younger wheat fields are yielding twice as much grain to the acre as our lands; England with less favorable conditions for wheat culture than we enjoy raises more than double the quantity of grain to the acre than we produce.

We may say of our entire agricultural interest that we shall double our production when we improve our methods. We cannot measure yet the potential benefits which our Agricultural Department and the agricultural schools will confer upon the nation by their persistent teaching of scientific methods of tillage A man near the east end of Long Island is demonstrating every year that the highest grade of farming gives the best profits. He spends money without stint for fertilizers; all his operations are kept to the highest point of efficiency and he is selling his crop of vegetables, the product of 80 acres, at an average figure of $20,000 a year. He is making as much money from the soil as he could from any other business with the same amount of capital.

The mistake is sometimes made of attributing to one factor more than its due share in bringing about the advanced stage of development we have reached. The attention of no American audience, however, needs to be called to the fact that in this nation of highly intelligent laborers, of inventive genius and of boundless energy and ambition, the geographic conditions that have so wonderfully helped us and some of which have been the topic of this brief discourse are only one of the all-potent influences which have advanced us to the rank we occupy among the great nations.

THE CONQUEST OF BUBONIC PLAGUE IN THE PHILIPPINES

THE United States has driven the bubonic plague out of the Philippines as completely as it has swept yellow fever out of Cuba.

The ravages of Asiatic cholera, which have claimed 100,000 victims in the islands, have diverted public attention from a fight against the bubonic plague waged by the health officers of Manila. This remarkable fight has no precedent in the history of the plague. If it had not been for the tireless vigilance and ceaseless war on rats and filth by Dr Meacham and his subordinates a wave of the plague would have swept over Manila and the islands as destructive of life as the cholera itself.

The plague is always present at Hongkong. There is not a day in the year when some plague-stricken wretch is not trying to hide in the densely packed quarters of that city. Manila, 600 miles across the sea, must therefore be constantly on her guard lest the plague slip in on one of the many vessels plying between the two ports.

The day after Christmas, 1899, a man was found in the streets of Manila dead from bubonic plague. The disease had invaded the city and began to spread.

How the plague was fought and beaten is told by Hon. Dean C. Worcester, Secretary of the Interior of the insular government, in his report to the Philippine Commission for 1902.

Bubonic plague was discovered at Manila December 26, 1899, and slowly

but steadily increased up to December, 1901.*

The deaths in 1900 numbered 199, and in 1901 reached a total of 432. The disease was at its worst each year during the hot, dry months of March, April, and May, nearly or quite disappearing during September, October, November, and December. It will be noted that the number of cases in 1901 exceeded that in 1900 by 200, while the number of deaths was about two and a half times as great, and the percentage of mortality among persons attacked increased from 73.4 in 1900 to 91.7 in 1901.

This heavy increase in plague for the year 1901 justified the apprehension that a severe epidemic would occur in 1902. Strenuous efforts were made to improve the general sanitary condition of the city, but the habits of the Chinese residents and the lower class of Filipinos were such as to render the enforcement of proper sanitary regulations well-nigh impossible.

On account of the important part which house rats are known to play in the distribution of bubonic plague, a systematic campaign was inaugurated against these rodents in Manila. Policemen, sanitary inspectors, and specially appointed rat-catchers were furnished with traps and poison, and both traps and poison were distributed to private individuals under proper restrictions. A bounty was paid for all rats turned over to the health authorities, and stations were established at convenient points throughout the city where they could be received. *Each rat was tagged with the street and number of the building* or lot from which it came, was dropped into a strong antiseptic solution, and eventually sent to the Biological Laboratory, where it was subjected to a bacteriological examination for plague. During the first two weeks 1.8 per cent of the rats examined were found to be infected. This proportion steadily increased, reaching the alarming maximum of 2.3 per cent in October. At this time numerous rats were found dead of plague in the infected districts, and, in view of the fact that epidemics of plague among the rats of a city in the past have been uniformly followed by epidemics among human beings, the gravest apprehension was felt, the rapid spread of the disease among the rats after the weather had become comparatively dry being a particularly unfavorable symptom.

It was deemed necessary to prepare to deal with a severe epidemic, and a permanent detention camp, capable of accommodating 1,500 persons, was accordingly established on the grounds of the San Lazaro Hospital. Hoping against hope, the board of health redoubled its efforts to combat the disease. The force of sanitary inspectors was greatly increased, and under the able supervision of Dr Meacham their work was brought to a high degree of efficiency. Frequent house-to-house inspections were made in all parts of the city where the disease was known to exist. The sick were removed to the hospital if practicable; otherwise they were cared for where found and the spread of infection guarded against.

Plague houses were thoroughly disinfected, and their owners were compelled, under the direction of the assistant sani-

*The deaths by months were:

Months.	Cases.		
	1900.	1901.	1902.
January	18	7	.....
February	48	27	1
March	64	63	2
April	54	111	.....
May	22	137	.....
June	19	35	.....
July	13	39	.....
August	18	34	.....
September	6	8	.....
October	7	8	.....
November	1	.....	.....
December	1	2	.....
Total	271	471	3

tary engineer, to make necessary alterations. Cement ground floors were laid, double walls and double ceilings, affording a refuge for rats, were removed, defects in plumbing were remedied, whitewash was liberally used, and, in general, nothing was left undone that could render buildings where plague had occurred safe for human occupancy. Buildings incapable of thorough disinfection and renovation were destroyed. *Buildings in which plague rats were taken were treated exactly as were those where the disease attacked the human occupants. The bacteriological examination of rats enabled the board of health to follow the pest into its most secret haunts and fight it there*, and was the most important factor in the winning of the great success which was ultimately achieved.

With very few exceptions, there was no recurrence of plague in buildings which had been disinfected and renovated. As center after center of infection was found and destroyed the percentage of diseased rats began to decrease, and in January, 1902, when, judging from the history of previous years, plague should have again begun to spread among human beings, there was not a single case. In February one case occurred. In March there were two cases, as against 63 in March of the preceding year, and before April the disease had completely disappeared.

This result, brought about at a time when the epidemic would, if unchecked, have reached its height for the year, marked the end of a fight begun by the board of health on the day of its organization and prosecuted unremittingly under adverse conditions for seven months with a degree of success which *has not been equaled under similar conditions in the history of bubonic plague*.

Especial credit is due to Chief Health Inspector Meacham for the ingenuity which he displayed in devising means for the destruction of rats and for the tireless energy with which he devoted himself to securing their adoption, and to increasing the efficiency of his force of inspectors, as well as to Drs. J. W. Jobling and Edward A. Southall and their assistants, who worked unremittingly at the uncongenial and dangerous task of making a bacteriological examination of rats, a large proportion of which were putrid, while not a few of them were infected with one of the most fatal of diseases. This work was of necessity conducted in the inadequate building in which it has been necessary temporarily to house the bureau of government laboratories, in close proximity to the civil hospital. The fact that not a single case of infection occurred among the laboratory force or the inmates of the hospital is sufficient commentary upon the care with which it was performed.

During 1901 plague appeared at several points in the provinces near Manila. Agents of the board of health were promptly dispatched to the infected municipalities and radical remedial measures were adopted, including in several instances the burning of infected buildings, the result being *the complete disappearance of plague in the provinces as well as in Manila*.*

A few figures will still further impress the American with the magnitude of this fight by his representatives in the Philippines. Of the 60,000 rats caught, tagged, and sent to the laboratory, 40,666 were examined microscopically for bacilli, and of these 242 were found infested with plague. During one month 65,379 traps were set and 403,789 plates of rat bane placed by the rat-catching squads, who had a special uniform and cap. The kind of poison had to be frequently changed, as the rats were very wary and suspicious. It is estimated that several hundred thousand rats were killed by the poison;

* Report of the Philippine Commission for 1902, vol. I, pp. 263–265. Government Printing Office, 1903.

TYPICAL CHOLERA HOUSE, OVER FILTHY OPEN DRAIN.

No. 1.—This picture and the several succeeding illustrations show the abominable shacks—hot-houses for bubonic plague and Asiatic cholera—which form such a large proportion of the habitations of Manila. There are 18,463 buildings in the city, of which 3,739 are good, 1,135 bad, 1,472 small, and 12,117 classed as shacks.

TYPICAL NATIVE WATER-CLOSETS.

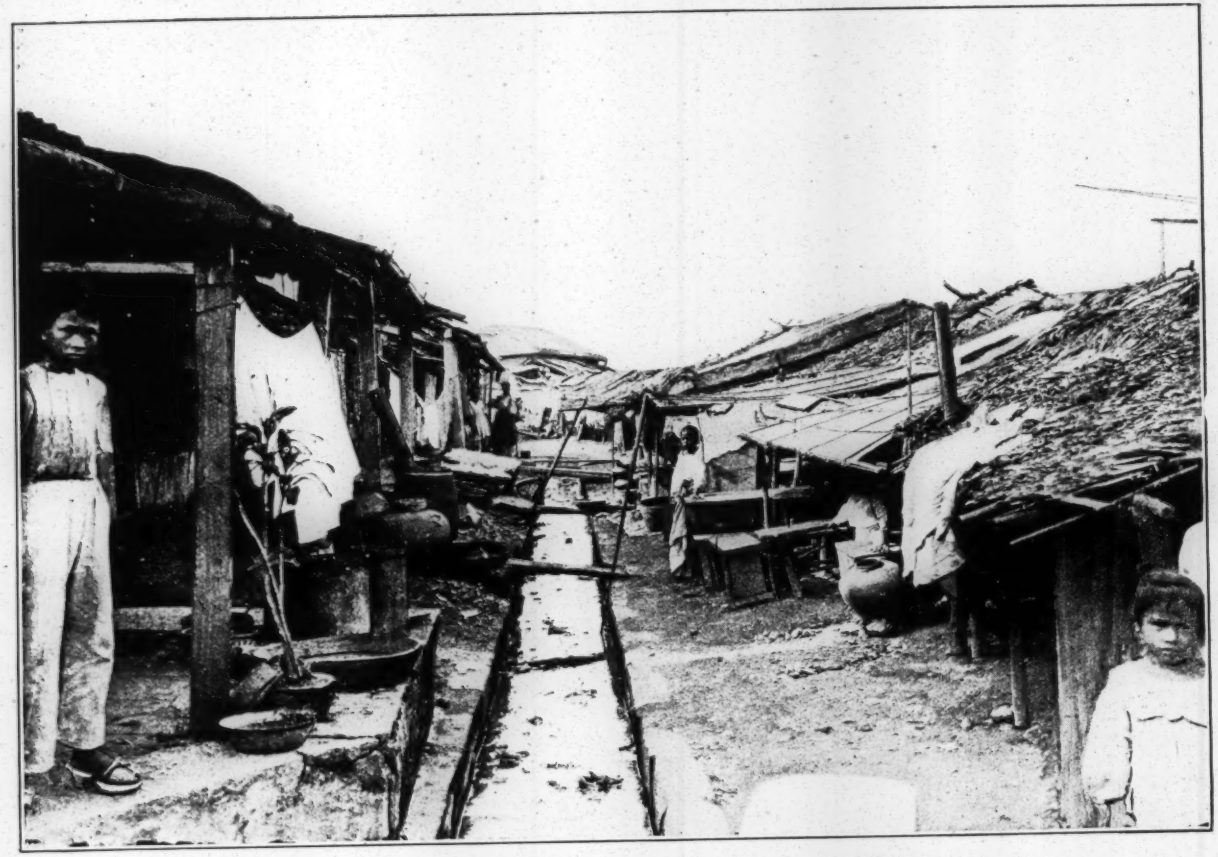
No. 2.—Manila has no sewage system, though it has a population of 250,000. When the Americans assumed control all drainage was by open conduits. Many of these conduits have since been covered over. Arrangements like those which are shown here occur at frequent intervals along the shore, and are breeding places of disease.

A TYPICAL CHOLERA CENTER.

No. 3.—When the cholera invaded the city these pestholes were burned, the owners being in every case reimbursed for their loss.

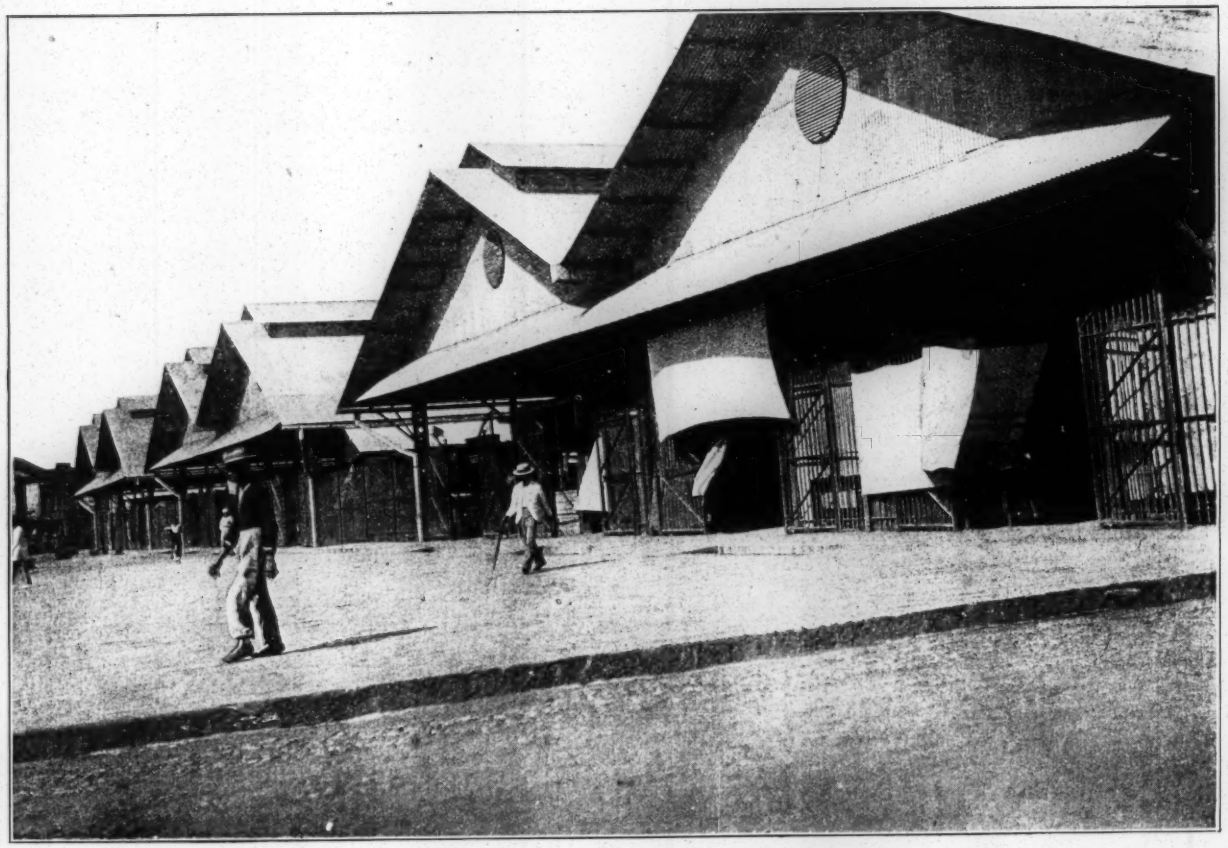
FAROLA DISTRICT AFTER BURNING OF INFECTED BUILDINGS.

No. 4.—The municipal authorities are making the experiment of building model tenement-houses on some of these burned areas. The people pay the same rent that they formerly did in their wretched shacks.



NATIVE MARKET, SHOWING "SHACKS" BACKING UP AGAINST FILTHY OPEN DRAIN.

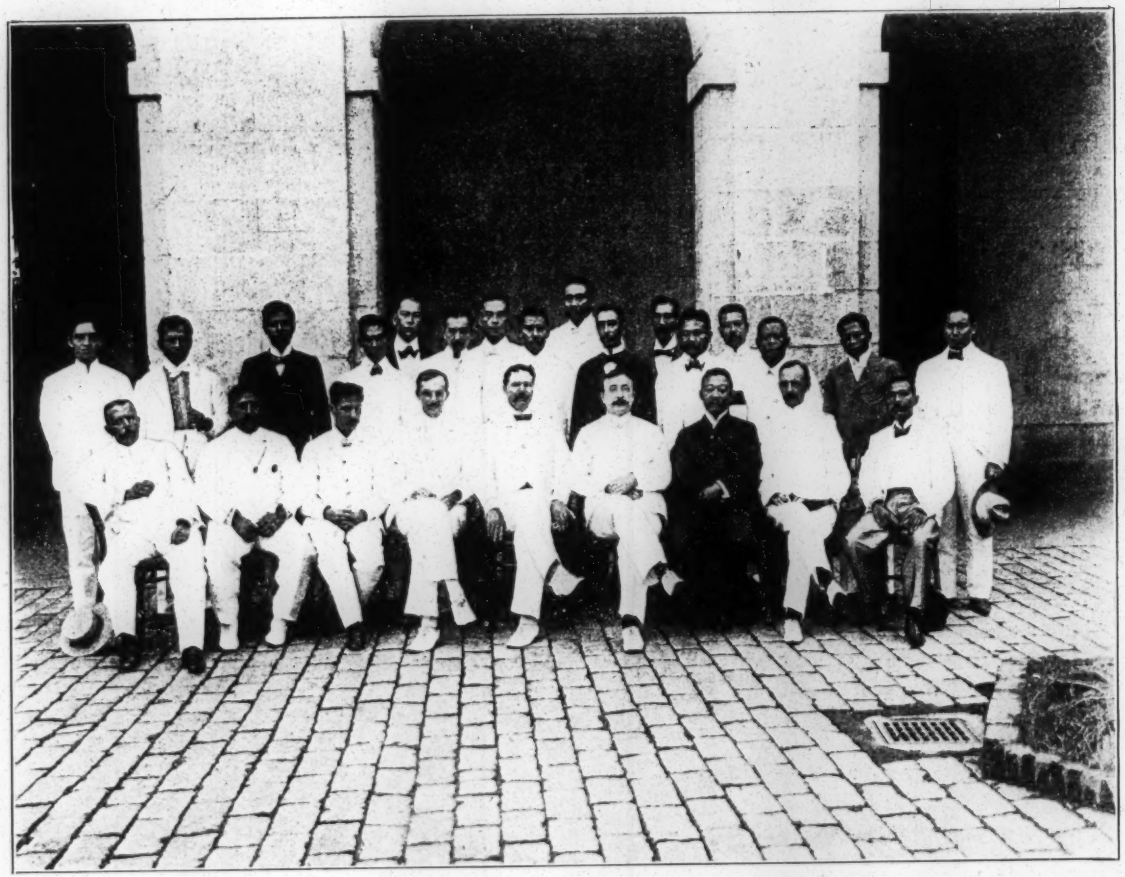
No. 5.—It is believed that cholera was introduced into Manila in some vegetables imported from China. Market places like this quickly helped to spread the disease. The authorities caused them to be abandoned and remodeled or rebuilt them.



DIVISORIA MARKET.

Completed November 11, 1901. Cost $155,469.50.

No. 6.—The municipal authorities have built four new markets in Manila, of which the Divisoria is the largest. The markets are not only sanitary, but are sufficiently profitable to pay interest on the money spent on their construction.



BOARD OF HEALTH FOR THE PHILIPPINE ISLANDS AND PRESIDENTS OF PROVINCIAL BOARDS OF HEALTH.

No. 7.

600 houses were remodeled, cleaned, and made habitable, and hundreds of shacks burned to the ground. In addition to all this, a systematic effort was made to immunize the susceptibles of Manila against bubonic plague by means of the Shiga antipestic vaccine. The work was begun on the 15th of January, 1902. From that date until the 15th of March over 25,000 persons were inoculated. The lower classes, including the Chinese, cocheros, laborers, servants, peddlers, etc., with their wives and children, who are the occupants of the lower floors and nipa houses, were especially selected for immunization. The government laboratory furnished from two to three hundred doses of the antipestic vaccine daily, but on account of the large number requiring immunization, it was necessary to cable Professor Kitasato, of Tokyo, for additional vaccine, and 50,000 doses were received from that source. The work was performed by native physicians, under the direction of Dr J. V. Tormey, medical inspector.

This long fight without rest day or night had told on Dr Meacham. When the battle was over and the plague had been driven from its last haunt, he collapsed. His strength was exhausted, he was unable to fight for himself, and died on April 14, 1902. It is unfortunate for the United States that the man who freed the Philippines of bubonic plague, Dr Franklin R. Meacham, and the man who freed Cuba of yellow fever, Dr Walter Reed, should both pass away the very moment their great work had been accomplished.

The plague had barely been defeated when Asiatic cholera attacked the city. Strict quarantine of infected districts and the burning of them when the disease became too violent, the closing of wells, a careful inspection of all vegetables, and a continuation of the cleansing of the city habitations checked the ravages of the disease, but could not prevent its spread. The water supply was kept from contamination by the rigid patrol of the United States Army, or conditions would have been many times worse. Several thousands died in Manila and about 100,000 in the provinces where the disease could not be controlled.

IMPROVEMENTS IN THE CITY OF MANILA

NO city was ever more in need of playgrounds or recreation fields. The natives of the islands take readily to games, and with little encouragement would become keen rivals in many of the sports at the present time confined to the American and foreign population. Owing to the lack of ordinary healthful exercises and diversion, the great army of clerks and officials and the rapidly increasing American and foreign population find but little to do after office hours beyond going to clubs or driving, and both are expensive amusements.

The board of public works is preparing plans for converting the large field in front of the Luneta, known as Camp Wallace, into a recreation ground open to everyone, where such sports as baseball, football, cricket, polo, and lawn tennis may be enjoyed. A part of the field will be devoted to a children's playground, modeled as nearly as possible after similar places in the United States. There is in preparation a plan for a city park, laid out with broad drives and walks, and also an aviary and zoölogical reserve, and all other elements of a modern park. With

STREET WORK, CARRIED ON BY FILIPINOS UNDER AMERICAN INSPECTORS, SHOWING HEAVY STONES USED IN RAISING THE STREET ABOVE THE LOW GROUND.

No. 8.—All the streets in Manila have been reconstructed since American acquisition. New roads and new bridges are being built wherever practicable. Harbors are being dredged, and breakwaters and other safeguards to shipping being constructed. All the funds for these improvements come from the insular revenue, which has been considerably increased by a slight land tax. Recently franchises were granted an American syndicate to put in an electric car and lighting service for Manila. The work is to be completed in two years. The fire department has been improved, and will soon compare favorably with the systems in the United States.

the building of the electric railroad such places will be accessible to every-one.

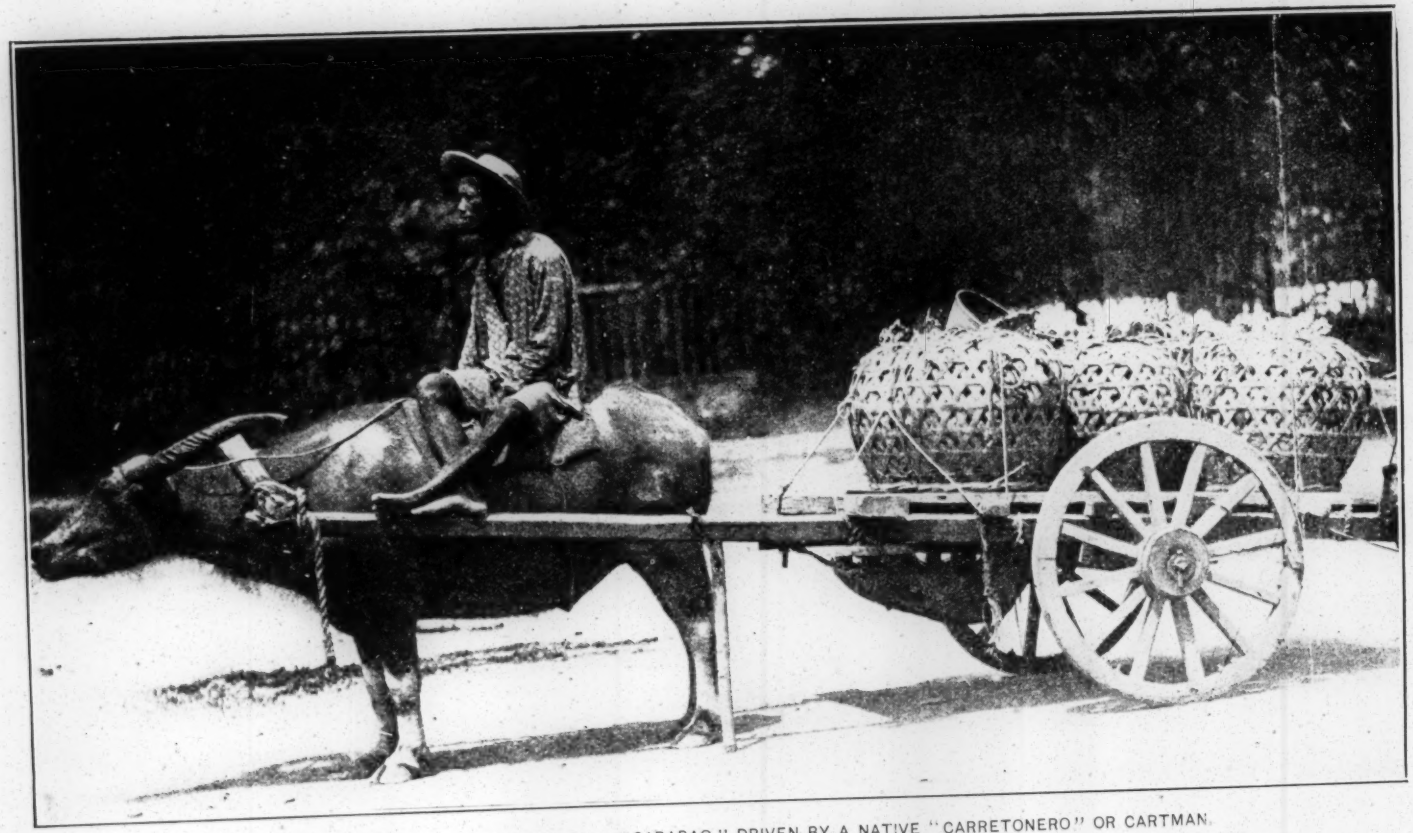
The botanical gardens on the Paseo de Bagumbayan have been improved and extended until they approach their former state under Spanish management. Originally this park had many beautiful trees and plants and a splendid collection of orchids, but nearly all of these, with the exception of the larger trees, were destroyed during the siege of the city and the insurrection. During the last few months the deer park has been completed, neatly fenced with wire, and stocked with a number of deer of different kinds from the various islands of the archipelago. There is also a monkey cage, and from time to time the animals and buildings are being added to. This is a very popular resort with all classes, especially the Filipinos.

The department of public works in Manila employs about 1,714 officers, mechanics, and laborers. Laborers are paid $1, 80 cents, and 60 cents per day, while a few subordinate assistants receive 50 cents and 40 cents a day. Wages are paid monthly. Ordinary labor is plentiful, while skilled labor is scarce. On the whole, Filipino labor has been very successful, but its value has been considerably hampered by the numerous fiestas and the after effects, such as laziness and extended absences. No Chinese are employed. The day consists of eight hours' work. The labor costs about 25 per cent more than it does in the United States, and is of an inferior quality.

AMERICAN DEVELOPMENT OF THE PHILIPPINES

GOVERNOR TAFT, in his last annual report, states that "the wealth of these islands must always be their agricultural products." Formerly the Filipinos produced enough from their fields and forests to be self-supporting; but as a result of long years of internal disturbances, the loss of 90 per cent of the carabaos from the rinderpest, and the recent devastation by cholera, most of the rice fields and farms have become overgrown with rank vegetation, and lately there has been widespread famine. Congress at its last session appropriated $3,000,000 to relieve the distress in the islands. Half of this sum will be used immediately to import thousands of carabaos from Ceylon and India to be sold to the people at cost price.

Meanwhile experts of the insular government have been devising means to help the farmers. A serum has recently been discovered which will protect the carabao inoculated with it from the rinderpest, so that carabaos may now be safely imported. Tubes of locust fungus, obtained from Dr L. O. Howard, of Washington, have been distributed and have checked the plagues of locusts. In one instance 64 bushels of dead locusts were found in the vicinity of a place where eight or ten locusts, infected with the fungus, had been released, and the remainder of the swarm had disappeared. A soil survey has been organized and has begun to examine the land in different sections of the islands to see whether new varieties of plants may not be introduced. Other experts have been trying to improve the native varieties by careful selection. Already the government has received applications asking for information from more than one thousand persons, mainly Filipinos, distributed throughout the archi-



CARRETÓN OR FREIGHT CART DRAWN BY A "CARABAO," DRIVEN BY A NATIVE "CARRETONERO" OR CARTMAN.

The baskets on the cart are made of cane and are called "báguit."

No. 9.—The carabao or water buffalo is the draught animal of the Philippines. He was probably imported originally from India. He is very dependent on his daily mud bath, and will seldom work without it for more than a couple of hours during the heat of the day. He is a wonderful swimmer, and does not hesitate to cross 10 miles of open sea. His hide is exceedingly tough, and a valuable leather is prepared from it, but the flesh is not highly esteemed.

HARROWING A FIELD FOR RICE.

No. 10.—Plowing the rice fields is too heavy work for the small Filipino pony, so the carabao is the only animal available for this purpose in the Philippines. The carabao has not, however, the strength and endurance one would expect from an animal of such huge bulk. If pushed too hard, he is apt to collapse and die of the heat.

STACKING RICE.

No. 11.—Dean C. Worcester states that the carabao has a great prejudice against the smell of a white man, and that in a secluded native village he has sometimes stampeded half the buffaloes in a place by simply walking along its main street.

pelago. Eighteen thousand two hundred and fifty packages of field and garden seeds, including 134 varieties, have been distributed to them. It has been proved that fairly good Irish potatoes and peas will grow in the lowlands near Manila. Beets also do well in the same locality, and radishes are ready for the table in three to four weeks after planting. Improved varieties of oranges and lemons brought from California are flourishing. A new species of wild grape has been discovered in the island of Negros. An effort is being made to improve it sufficiently for cultivation, as no grapes to speak of have heretofore been grown on the islands. Fifty-two fiber-producing plants are known to exist in the Philippines, but only two of these have been of commercial value. Experts are experimenting to see whether some of the other fifty varieties may not also be profitable.

These are only some of the practical devices of the government to better conditions. The wasteful methods of the different industries—such as the gutta-percha, the tobacco, the sugar cane, and the hemp—at present causing a loss of fully 50 per cent in the product, are being corrected by educating the Filipino to a more economical and hence more profitable system.

An experiment station for the growing of rice on a large scale is being established. The present Filipino method of rice growing seems ridiculously antiquated. Every blade of the millions of stalks on a large rice plantation is now planted by hand. The labor is most exhausting, since it must be done in stooping posture, either under the burning sun reflected from the muddy water or under a mighty downpour of rain. Looking over the paddy fields in the month of October, it seems incredible that every blade was planted by hand. An effort is to be made to introduce the American drill for planting. Modern farming implements are being introduced and their use taught the natives. An extensive stock farm for the breeding of draft and dairy animals is also being established. The funds for these experiment stations are advanced by the government, but the stations are intended to be and will doubtless soon become self-supporting.

Professor Worcester believes that the agricultural opportunities in the Philippines for young Americans are considerable. Only a small part of the soil capable of producing sugar, hemp, and tobacco is under cultivation. Large areas of government lands are admirably adapted to the cultivation of cocoanuts, for which there is a large and profitable demand. The trees can be grown readily and with comparatively little danger of loss. Under existing conditions, the minimum annual profit from a fairly good bearing tree is $1 Mexican, and frequently two or three times this amount is realized. Other crops, such as Indian corn and alfalfa, can be grown between the rows of cocoanut trees while the latter are maturing, and used to fatten hogs, which always bring a good price in the Philippine market. The demand for copra in these islands is greatly in excess of the supply and is steadily increasing, while cocoanut oil now sells readily in Manila at $1.25 Mexican per gallon.

The lands along the coast of Mindanao and Paragua are particularly favorable to cocoanut growing, and in the latter island trees are said to come to bearing in four years.

No other country has climate and soil so favorable to cacao growing as Mindanao. The cacao now produced in that island is of superior quality and is nearly all bought up for shipment to Spain, where it brings an especially high price. There are numerous other regions in the islands where cacao can be raised to great advantage, but there is not today a cacao plantation in the archipelago, the Filipinos having almost invariably con-

PRIMITIVE AGRICULTURE. TAGBANUA WOMEN HARVESTING RICE, CALAMINANES ISLANDS.

No. 12.—The inhabitants of the Calaminanes group spend most of their time in gathering edible birds' nests, sea cucumbers, turtles, shells, and a few pearls, which they sell to passing vessels. Their agricultural methods are exceedingly backward, though the soil of their islands is very fertile.

tented themselves with planting a few scattering bushes, which are left practically without care, to be swamped by brush and preyed upon by insects. Proper harvesting and curing methods are not employed. The fruits are torn from the bushes, injuring the bark and leaving the way open for the attacks of injurious insect pests.

An especially fine coffee is grown in the mountain regions of Benguet and Bontoc and in the province of Lepanto. The bushes yield heavy crops and the unhulled coffee at present sells readily in Manila at $35 Mexican per cavan, for consumption in these islands or for shipment to Spain. Coffee bushes come to bearing in Benguet in three years. There is no region in the United States which has a more healthful or delightful climate than is afforded by the Benguet highlands, where a white man can perform heavy field labor without excessive fatigue or injury to his health.

It is almost impossible to secure in Manila the milk needed by the sick. Fresh milk sells for 75 cents Mexican per wine quart. A dairy on the outskirts of the city, with 95 animals, including several bulls, was netting $5,000 Mexican per month when the animals were attacked by rinderpest.

Fresh meats to the value of $609,664 per annum, exclusive of that used by the Army and Navy, are being imported each year into Manila. There is no reason why in time the islands should not supply this meat. The pastures of Benguet, Lepanto, and Bontoc afford one vast well-watered cattle range, where improved breeds of horned cattle could be successfully introduced, while in the lowlands there are vast stretches of grazing lands suitable for raising cattle and carabaos. The latter are at present worth $150 to $300 Mexican per head in the Manila market. Properly conducted cattle ranches will certainly yield very handsome returns.

Excellent native oranges are produced in the province of Batangas, in the Calamianes Islands, and elsewhere. The trees, which are often large and vigorous, seldom receive any care, nor has any systematic effort been made to improve the quality of the fruit, which sells readily at a good price. There is every reason to believe that improved citrus fruits can be successfully introduced.

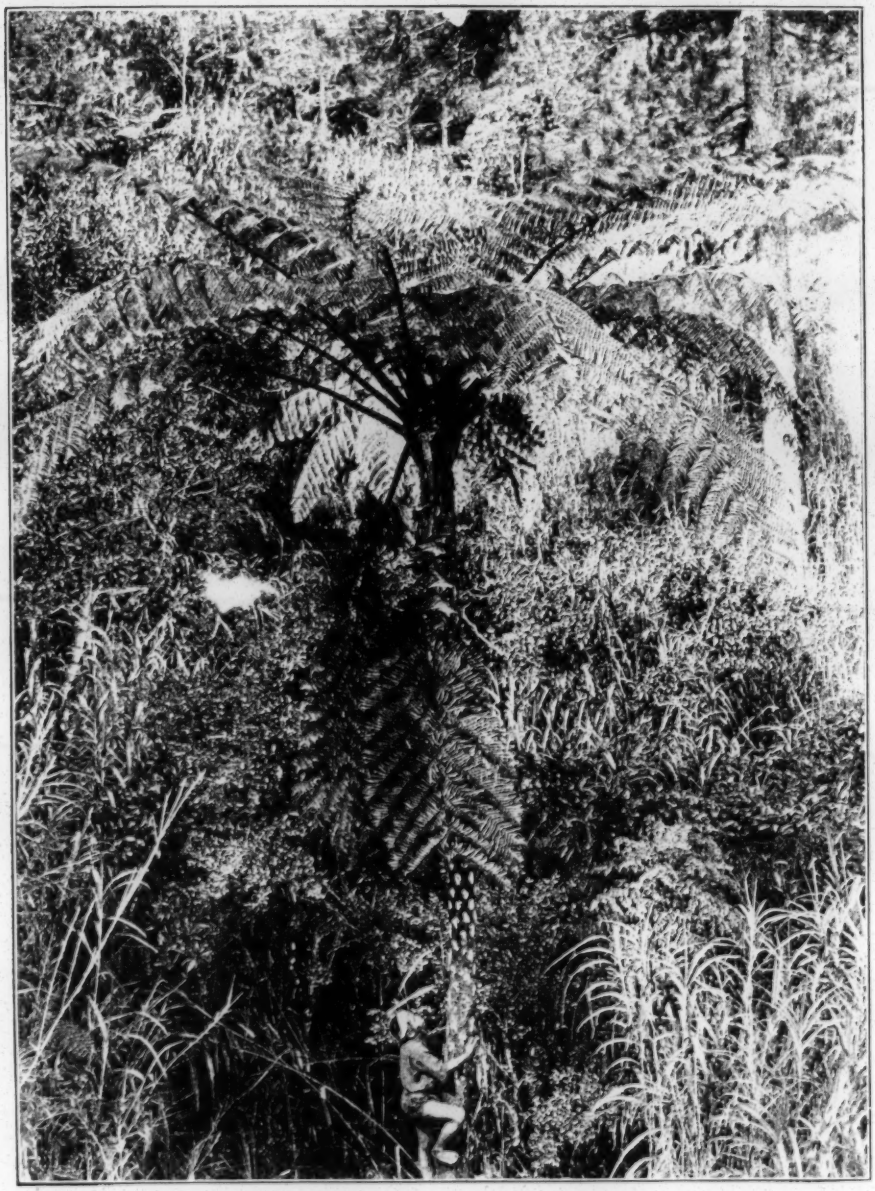
Numerous new industries, such as raising of vanilla in the lowlands and the cultivation of fruits and vegetables peculiar to the temperate zone in Benguet, ought, if properly conducted, to result profitably.

BENGUET—THE GARDEN OF THE PHILIPPINES

IN a cablegram to the Secretary of War dated April 15, Governor Taft announced his arrival at Benguet, which he described as follows:

"Great province. This is only 150 miles from Manila, with air as bracing as Adirondacks or Murray Bay. Only pines and grass lands. Temperature this hottest month in the Philippines, in my cottage porch at 3 in the afternoon, 68° F. Fires are necessary night and morning."

Benguet is a little province about the size of Rhode Island. It consists almost entirely of high mountains, some of them reaching to 7,000 feet, and resembles an American park in the variety and beauty of its scenery. The elevated tablelands of the province Governor Taft plans to make a health

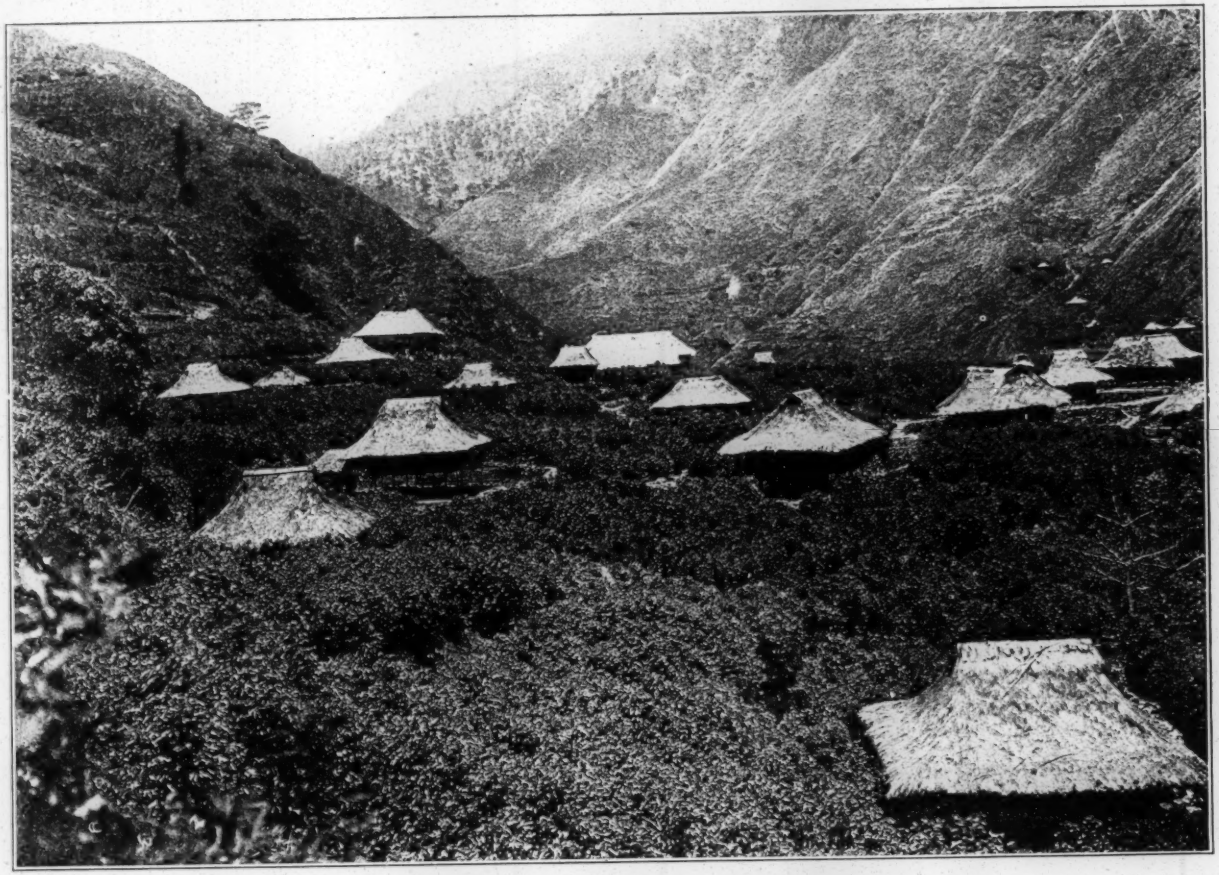


IGORROTE CLIMBING A TREE FERN, BENGUET.

No. 13.—In Benguet Province, Luzon, gigantic tree ferns and the northern pine are seen growing side by side. It is a wonderful region, where tropical, subtropical, and temperate zone plants thrive equally well.

IN THE PINES. BENGUET.

No. 14.



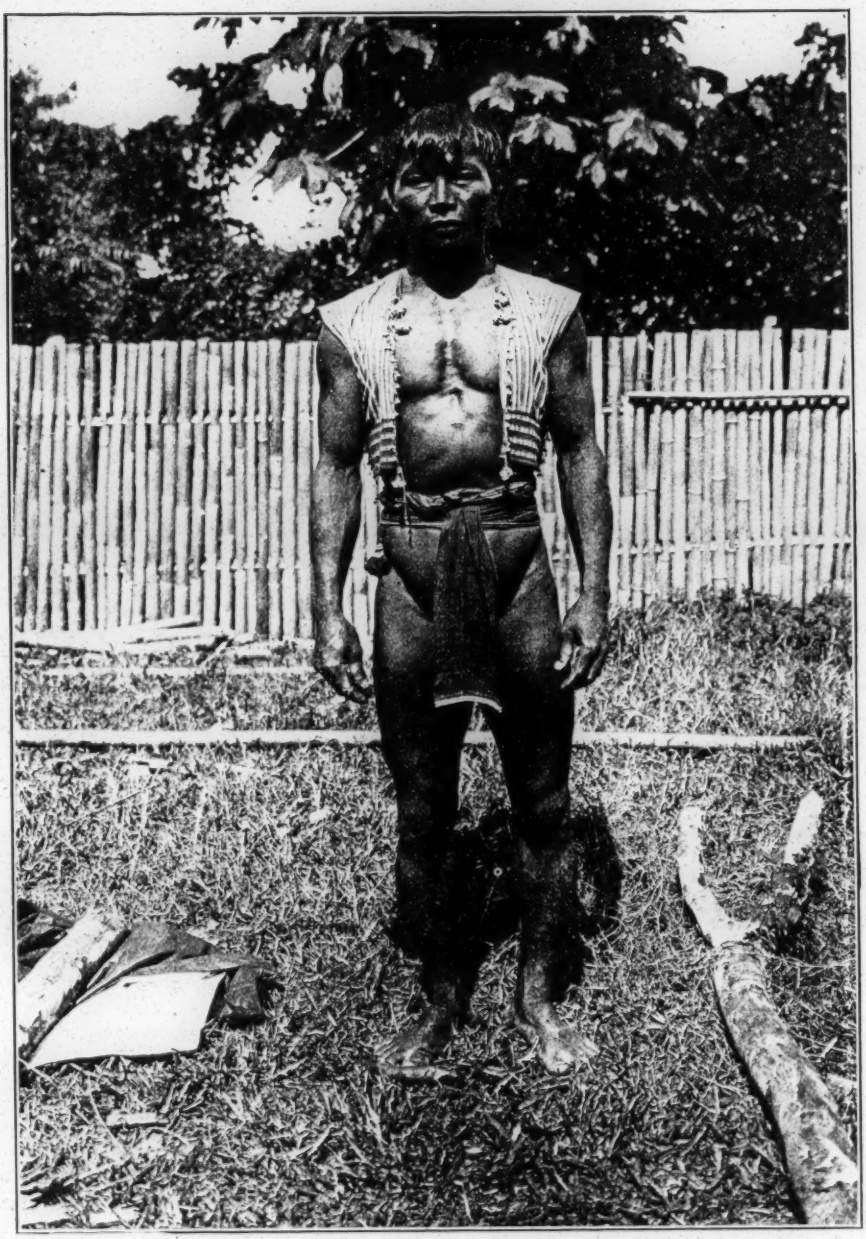
THE IGORROTE TOWN OF CABAYAN, BENGUET, LUZÓN

Houses surrounded by coffee bushes.

No. 15.—Some of the finest coffee in the world is grown in these valleys by the Igorrotes.

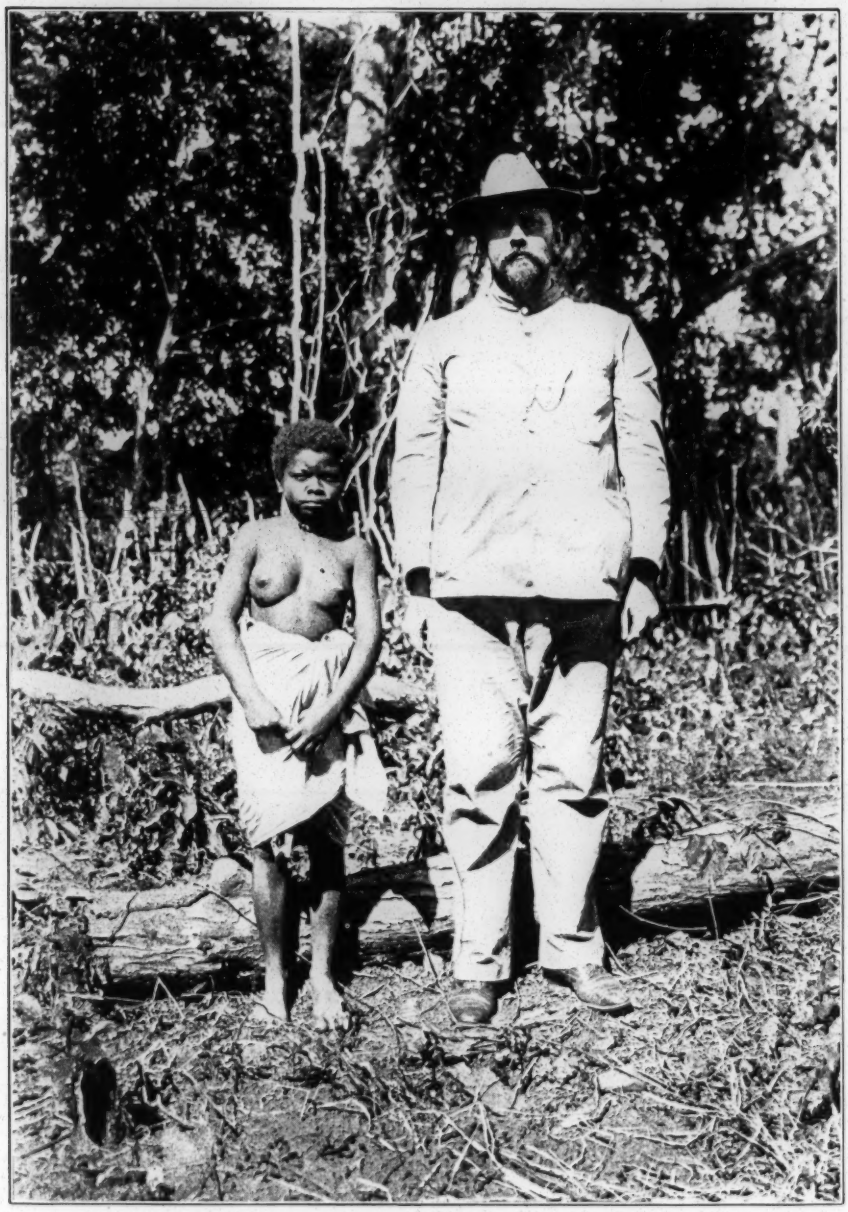
IGORROTE RICE TERRACES, CABAYAN, BENGUET, LUZÓN.

No 16.—The Igorrotes are the Highlanders of the Philippines. They are a fine race, spread over the northern half of Luzon, and have considerable mechanical ability.



A CHIEF OF THE GADDANES, ISABELA, LUZÓN.

No. 17.—One of the most important branches of the insular government is the Bureau of Non-Christian Tribes, whose duty it is to find out the actual conditions of the various non-Christian tribes in the archipelago. These tribes comprise about 2,000,000 people. At present no accurate information is to be had about them. They cover Northern Luzon, Mindoro, Palawan, and the great island of Mindanao. Some of them, like the Negritos, are comparatively harmless, while others, like the Gaddanes, are fierce and hard to control. It is said that head hunting is still practiced by the Gaddanes, and that a young man of this tribe cannot find a bride until he has at least one head to his credit.



ADULT NEGRITO WOMAN, SHOWING RELATIVE SIZE.

No. 18.—The Negritos are physical and mental weaklings, and are rapidly disappearing. They are found in the interior of all the larger islands, and are generally supposed to have been the first inhabitants of the islands, having come from New Guinea. They hide in the mountain forests, where they were driven by later invaders. There are about 30,000 of them left. They live on the fruits and tubers which they find in the forest, and like the pigmies of Africa kill their game with poisoned arrows.

resort for the Americans in the islands. At present it is reached only by horse trail, but a wagon road is being built by the insular government and a railway has been surveyed and will be constructed before many years.

Forests of pine and cedar cover the higher slopes of the mountains, while lower down in the valleys gigantic ferns are seen.

It may well be doubted if any region in the world offers such unexcelled advantages for experimental work with plants as are presented by the climate and soil of Benguet. The climate admits of the growing of a great variety of tropical, subtropical, and temperate zone plants. In the gardens of the governor one may see coffee bushes bearing heavily, fine tea plants, hot-house gardenias, caladiums, dracænas, frangipani, and mango trees, all characteristic of the tropics; alsophila tree ferns, scarlet hibiscus, passion fruit, begonias, hydrangeas, and many other plants of the subtropical regions, and side by side with these potatoes, tomatoes, peas, beans, celery, and other garden vegetables and monthly roses, all strictly temperate zone products, while the neighboring hillsides are covered with pine trees and produce raspberries and huckleberries in considerable abundance.

A red volcanic soil covers large areas in the province. This soil seems extraordinarily fertile. At the beginning of the rainy season last year, the most unfavorable time, cabbage, tomatoes, onions, leeks, carrots, turnips, parsnips, beans, peas, cucumbers, marrow, squashes, pumpkins, salsify, Irish potatoes, white oats, wheat, millet, and alfalfa were sown, and the results would have done justice to California.

On the elevated plateau are vast stretches of well-watered grazing land, where thousands of horned cattle can find rich pasturage.

About 15,000 people live in Benguet, nearly all of whom are Igorrotes. The Igorrotes of this province are intelligent, and pronounced vastly superior to the average Filipino. They are willing workers, cheerful, trustworthy, and skillful laborers. The illustrations Nos. 15 and 16 show that they possess considerable natural talent in construction. They are non-Christianized, having always resisted the attempts of the Spanish to convert them.*

* REFERENCES.—The following list of official works relating to the Philippines, published by the government, may be of service. The reports may be purchased from the Superintendent of Public Documents, Washington, D. C.:

Report of the Shurman Commission, 4 vols., $2.35.

First Report of the Taft Commission, November 30, 1900, 1 vol., $0.50.

Second Report of the Taft Commission, June 30, 1901, 2 vols., $0.95.

Third Report of the Taft Commission, November 1, 1902, 2 vols., $1.65.

Atlas of the Philippines, $3.15.

Pronouncing Gazetteer and Geographical Dictionary of the Philippines, $2.10.

The Coal Measures of the Philippines, $0.40.

The People of the Philippines, $0.05.

THE BRITISH SOUTH POLAR EXPEDITION

THE Antarctic expedition sent out by the Royal Geographical Society and Royal Society of England in 1901 has done very good work during its first year in the far south. Captain Scott, the leader, with a sledging party, succeeded in getting 100 miles nearer the South Pole than any predecessor, reaching 80° 17′; the expedition wintered 400 miles further south than any other expedition had ever done before, which makes their meteorological and other scientific observations specially valuable; in their

vessel the *Discovery* they coasted along the ice-barrier one hundred and fifty miles beyond the point where James Clarke Ross stopped 60 years ago. This ice-barrier extends from the land out upon the water. From its front, which Captain Scott believes floats on the water, the great southern icebergs break, towering sometimes to nearly 1,000 feet, and compared to which the icebergs of the North Atlantic are but pigmies. After coasting for many days along the ice-front to longitude 152° 30′, latitude 76°, they returned and put in at a safe harbor—MacMurdo Bay. This they made their base of action. Here they passed the winter in sight of Erebus, the volcano which Ross had seen belching forth fire and smoke in 1841. It is quiet now. A sledging party ascended a glacier to the height of 9,000 feet, and found a level plain stretching to the west as far as the eye could reach.

In latitude 82° they discovered an extensive mountainous region, hitherto absolutely unknown, extending to 83° 20′ nearly due south. This discovery seems to indicate that land stretches to the Pole in a series of lofty mountains, and is an important geographical result.

CAPTAIN SCOTT'S REPORT

The *Morning*, the auxiliary wooden ship that left New Zealand December 6, 1902, to carry supplies to Captain Scott, found the expedition at their winter base on Victoria Land, left the provisions, and then returned to New Zealand. The following is Captain Scott's report of his work until the arrival of the *Morning*:

The *Discovery* entered the ice-pack on December 23, 1901, in latitude 67° south. Cape Adare was reached on January 9, but from there a heavy gale and ice delayed the expedition, which did not reach Wood Bay till January 18. A landing was effected on the 20th in an excellent harbor, situated in latitude 76° 30′ south. A record of the voyage was deposited at Cape Crozier on the 22d. The *Discovery* then proceeded along the barrier within a few cables' length, examining the edge and making repeated soundings. In longitude 165° the barrier altered its character and trended northwards. Sounding here showed that the *Discovery* was in shallow water. From the edge of the barrier high snow slopes rose to an extensive, heavily glaciated land, with occasionally bare precipitous peaks. The expedition followed the coast line as far as latitude 76°, longitude 152° 30′. The heavy pack formation of the young ice caused the expedition to seek winter quarters in Victoria Land. On February 3 the *Discovery* entered an inlet in the barrier in longitude 174°. A balloon was sent up and a sledge party examined the land as far as latitude 78° 50′, near Mount Erebus and Terror. At the southern extremity of an island excellent winter quarters were found. The expedition next observed the coast of Victoria Land, extending as far as a conspicuous cape, in latitude 78° 50′. It was found that mountains do not exist here, and the statement that they were to be found is clearly a matter for explanation. Huts for living and for making magnetic observations were erected, and the expedition prepared for wintering. The weather was boisterous, but a reconnaissance of sledge parties was sent out, during which the seaman Vince lost his life, the remainder of the party narrowly escaping a similar fate. The ship was frozen in March 24.

The expedition passed a comfortable winter in well-sheltered quarters. The lowest recorded temperature was 62° below zero. The sledging commenced with the coming of spring, on September 2, parties being sent out in all directions. Lieutenant Royds, Mr Skelton, and party successfully established a record in an expedition to Mount Terror, traveling over the barrier under severe sledging conditions, with a temperature of 58° below zero. Commander Scott, Dr Wilson, assistant sur-

geon, and Lieutenant Shackleton traveled ninety-four miles to the south, reaching land in latitude 80° 18′ south, longitude 163° west, and establishing a world's record for the farthest point south. The journey was accomplished in most trying conditions. The dogs all died, and the three men had to drag the sledges back to the ship. Lieutenant Shackleton almost died from exposure, but is now quite recovered. The party found that ranges of high mountains continued through Victoria Land. At the meridian of 160° foothills much resembling the Admiralty Range were discovered.

The ice barrier is presumably afloat. It continues horizontal and is slowly fed from the land ice. Mountains, ten or twelve thousand feet high, were seen in latitude 82° south, the coast line continuing at least as far as 83° 20′ nearly due south. A party ascending a glacier on the mainland found a new range of mountains. At a height of 9,000 feet a level plain was reached, unbroken to the west as far as the horizon.

The scientific work of the expedition includes a rich collection of marine fauna, of which a large proportion are new species. Sea and magnetic observations were taken, as well as seismographic records and pendulum observations.* A large collection of skins and skeletons of southern seals and sea birds has been made. A number of excellent photographs have been taken and careful meteorological observations were secured. Extensive quartz and grit accumulations were found horizontally bedded in volcanic rocks. Lava flows were found in the frequently recurring plutonic rock which forms the basement of the mountains.

*It will be interesting to note whether the disturbances of Mont Pelée and La Souffrière, and in Guatemala and Mexico during the past twelve months have been recorded by Captain Scott's instruments or by any of the South Polar expeditions.

Before the arrival of the *Morning* the *Discovery* had experienced some privation, owing to part of the supplies having gone bad. This accounted for the death of all the dogs. She has, however, revictualled from the *Morning*, and the explorers are now in a position to spend a comfortable winter.

RECORDS OF FARTHEST SOUTH

The following table, compiled by Mr Cyrus C. Adams, gives the records of the most important Antarctic explorers arranged in the order of the most southerly points attained; it gives the names of the explorers, the year in which they reached their most southerly latitude, the latitude and longitude they attained, the method of reaching it, whether by sledge or ship, and the name of the vessel or vessels in their expeditions:

S. lat.	Long. from Gr.	
80° 17′	163° 00′ W.	Captain Scott, 1902, sledge, steamer *Discovery*.
78 50	165 00 W.	Borchgrevink, 1900, sledge, steamer *Southern Cross*.
78 10	161 27 W.	Captain James Ross, 1842, ship, sailing vessels *Erebus* and *Terror*.
74 15	34 17 W.	Captain Weddell, 1823, ship, sailing vessels *Jane* and *Beaufoy*.
71 36	87 39 W.	Lieutenant De Gerlache, 1899, ship, steamer *Belgica*.
71 30	15 00 W.	Captain James Ross, 1843, ship, sailing vessels *Erebus* and *Terror*.
71 10	106 54 W.	Captain Cook, 1774, ship, sailing vessels *Resolution* and *Adventure*.
69 53	92 19 W.	Captain Bellingshausen, 1821, ship, sailing vessels *Vostok* and *Mirny*.
69 40	12 00 E.	Captain Biscoe, 1831, ship, sailing vessels *Tula* and *Liveley*.
69 21	2 15 W.	Captain Bellingshausen, 1820, ship, sailing vessels *Vostok* and *Mirny*.
69 10	79 00 W.	Captain Evensen, 1894 ship, sailing vessel *Hertha*.
69 00	172 11 E.	Captain Balleny, 1839, ship, sailing vessels *Eliza Scott* and *Sabrina*.
68 10	60 00 W.	Captain Larsen, 1893, ship, sailing vessel *Jason*.
67 5	147 30 E.	Lieutenant Wilkes, 1840, ship, sailing vessel *Vincennes*.
67 51	39 40 W.	Captain Moore, 1845, ship, sailing vessel *Pagoda*.
67 31	142 54 W.	Captain Cook, 1773, ship, sailing vessels *Resolution* and *Adventure*.

GEOGRAPHIC NOTES

BUREAU OF FORESTRY

THE plan which Maryland adopted some time ago of getting the coöperation of the Bureau of Forestry in making a detailed study of her forests is a most excellent one, and is equally available to all the states and about equally advantageous to them. With the help of the trained foresters of the Bureau of Forestry the Maryland Geological Survey was able to make an inventory of the forest wealth of the state, finding out how much there is of it, the condition it is in, what benefit it is to the state, including its effects on stream flow and on agriculture; how much damage it has suffered, and how such damage may be lessened. The forests of Allegany, Cecil, Garrett, Calvert, and Harford counties have already been thoroughly studied by experts of the Bureau of Forestry, and reports for the first three have been published by the state.

The work suggests the very great advantages of a similar coöperation between other states and the Bureau of Forestry, although the examinations need not always be as detailed as in the case of Maryland. The matter is extremely simple and may be easily arranged, and the results are valuable out of all proportion to the cost of such work to the states. The Bureau furnishes and pays the salaries of the experts who make the examination, when the state has guaranteed their field expenses. The reports of the Bureau's experts become the property of the state, provided they are credited, when published, to the Bureau.

For a long time the Bureau of Forestry has been urging state investigations of forest lands, because the results of such investigations are as valuable to the Bureau as to the states themselves. Inquiries are constantly received from lumbermen and others regarding the forest resources of different states which the Bureau is unable to answer fully, because often no accurate studies of the regions have been made. Every bit of reliable information concerning the forests of the different states and territories is welcomed by the Bureau as contributing to the sum of knowledge of the forest resources of the whole country on which the Bureau must base its general forest policy.

States like New York, Massachusetts, New Hampshire, Connecticut, Pennsylvania, Minnesota, Michigan, and Wisconsin, which are working out for themselves some sort of forest policy, find it absolutely essential to take stock of their timber lands. Michigan has begun such an examination, through coöperation between the state forest commission, the university authorities, and the Bureau of Forestry. A study already made of 60,000 acres of forest preserve lands in northern Michigan by T. H. Sherrard, of the Bureau of Forestry, resulted in recommendations for fire-protection experiments and for tree planting, which have been submitted to the state legislature. California has appropriated $15,000 for an examination of the forests of the state. A report on the forests of Texas has been prepared under direction of the Bureau of Forestry, and will probably form when published the basis for forest legislation in the state. Several years ago the forests of the northern part of Wisconsin were examined by Filibert Roth, of the Bureau, and his report was published by the Bureau and by the state. Prof. J. G. Jack, of the Bureau, two years ago made an examination of the forests of Vermont, and the work was continued more recently by C. D. Howe. Recommendations for forest preserves before being acted upon by the legislature must be supported by reliable

studies of the forest growth on the areas which it is proposed shall be reserved. New Hampshire, alarmed by the heavy cutting in the White Mountains, has appropriated $5,000 for an examination of that region by the Bureau of Forestry, and an examination of the forest lands on Long Island may form a part of the summer's work of the Bureau.

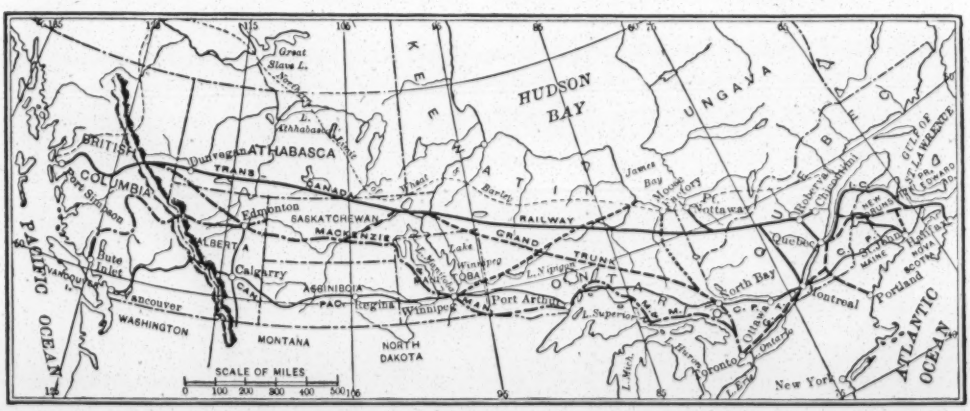
THE NEW TRANS-CANADA RAILWAY

THE projected new trans-continental railway, for which the Dominion Government recently granted a charter to the Trans-Canada Railway Company, is described by Mr E. T. D. Chambers in the *Review of Reviews* for April. Of the commercial importance of the new road Mr Chambers writes as follows:

"The proposed line of the Trans-Canada Railway is one of the most direct which can span the continent. Starting from deep-water termini at Chicoutimi—the head of navigation on the Saguenay River—at Quebec, and at Montreal, it is destined to traverse and develop the best part of the newly discovered wheat and timber lands of northern Quebec in the James Bay district, to tap the whole of the James Bay and Hudson Bay trade, to open up the valuable mineral country of northern Ontario, to cross the center of the rich wheat lands of the Peace River valley, and, finally, to reach one of the finest ports on the Pacific coast by a pass in the mountains only 2,000 feet high, as compared with 4,425 at Crow's Nest, and with 5,400 at Kicking Horse.

"The most cursory glance at the line laid down on the map for the new road reveals the directness of the route and and its far-northern location.

"From Quebec to Port Simpson *via* the Trans-Canada Railway will be only 2,830 miles, all of the route south of the northern limit of wheat, while the distance between the same points *via* the Grand Trunk Railway will be about 3,400 miles, and that from Quebec to Vancouver by the Canadian Pacific Railway is 3,078 miles. The expected saving in both distance and gradients by the proposed road over existing routes from Manitoba to the Canadian seaports on the St Lawrence is so great that the promoters have already undertaken to carry wheat from all points on its line in the Province of Manitoba to the ocean steamer at Chicoutimi, Montreal, or Quebec at rates which will save the farmers of Manitoba and the Northwest about seven cents per bushel on present cost of transportation to the



Courtesy of Review of Reviews

Map showing Route of new Trans-Canadian Railway

seaboard. It is claimed that this saving alone will much more than pay the total interest upon the cost of the road's construction.

"It is admitted on every hand that the terminal seaports of the Trans-Canada leave nothing to be desired. The harbor of Port Simpson is said to be the finest on the Pacific coast north of San Francisco. It has the additional advantage of being much nearer to Yokohama than either Vancouver or San Francisco. Nottaway, on James Bay, which is to be reached by a branch of the main line, is the only deep-water harbor on the bay, and with some dredging might be used by vessels drawing thirty feet of water. The coast line of James and Hudson Bays, tributary to this railway, will be about four thousand miles. Chicoutimi, on the Saguenay, can be reached by vessels of any draught, and Quebec has magnificent docks, which have cost the government millions of dollars, with deep-water berth and elevator facilities for steamers of any draught. The new bridge now building over the St Lawrence, at Quebec, will enable the Trans-Canada road to make use of St John and Halifax for winter ports if ever those of Quebec and Chicoutimi should be blocked by ice."

EXPEDITION TO TURKESTAN

DR RAPHAEL PUMPELLY is on his way to Turkestan on a most important scientific mission. His journey is for the purpose of looking over the ground in Turkestan with reference to a combined physico-geographical and archæological exploration, if such further work should be found to be promising as to results and practicable as regards execution.

It has been his wish to see this done for forty years, and the results obtained by Russian surveys in recent years in connection with some parts of the problem have strengthened his belief that the region offers a field of the greatest interest in connection with the relation between the growth and changes—social, economic, and ethnological—of nations and measurable changes in their environment.

The journey is made under the auspices of the Carnegie Institution. Prof. W. M. Davis, of Harvard, will have charge of the physical geographical part of the problem and will meet him on the Caspian early in May. In the meantime Dr Pumpelly has gone to St Petersburg to obtain the permission of the Russian Government, on whose willingness and sympathy all depends.

GEOLOGICAL SURVEY

THE Survey has begun an experiment which will doubtless prove of great practical service to the mining interests of the country. Heretofore the explorations of the geologists of the Survey have not been available until one to two years after the explorations were made. To prepare and to publish the complete report of a season's work takes considerable time. By the new arrangement such results of the season's work as have direct economic importance are to be published at once in advance of the purely scientific investigations. This plan has been begun by the publication of a bulletin (No. 213) which summarizes the work of economic character done in 1902. The bulletin, says Dr C. Willard Hayes in the preface, "is designed to meet the wants of the busy man, and is so condensed that he will be able to obtain results and reach conclusions with a minimum expenditure of time and energy. It also affords a better idea of the work which the Survey as an organization is carrying on for the direct advancement of mining interests throughout the country than can readily be obtained from the more voluminous reports."

The bulletin contains 60 brief papers, of which the following may be mentioned: "Investigation of Metalliferous Ores," by S. F. Emmons; "Placer Gold Mining in Alaska in 1902," by Alfred H. Brooks; "Gold and Pyrite Deposits in the Dahlonega District, Georgia," by E. C. Eckel; "Mineral Deposits of the Bitterroot Range and the Clearwater Mountains, Montana," by W. Lindgren; "Gold Mining in Central Washington," by George Otis Smith; "Ore Deposits of Tonopah and Neighboring Districts, Nevada," by J. E. Spurr; "Ore Deposits of Butte, Montana," by W. H. Weed; "Lead, Zinc, and Fluorspar Deposits of Western Kentucky," by E. O. Ulrich and W. S. T. Smith; "Coal Fields of the United States," by C. Willard Hayes.

GEOLOGICAL HISTORY OF NEW YORK CITY

THE geological history of New York and its vicinity is discussed at great length, illustrated by numerous maps and pictures, in New York City Geologic Folio, No. 83, recently issued by the Geological Survey.

Tens of thousands of years ago the greater part of the State of New York was covered by an immense glacier, similar in character to those now found in Switzerland and Alaska, but immensely greater in area and thickness. This ice sheet had gathered up in its course large quantities of sand, gravel, and mud. Part of this burden was pushed before the ice mass, and as the front of the glacier came to rest in the latitude of the city, the material pushed ahead of it was deposited there. When the glacier disappeared, owing to the coming on of a warmer climate, the mass of material deposited along its front became the familiar rounded hills of Long Island—the so called backbone of the island.

After the disappearance of the ice sheet, the land in the vicinity of the city sank, so that the sea covered points now 100 feet above tide level. During this period of submergence, the great brick-clay beds along the Hudson River were deposited. The traveler on the Central or the West Shore road can now see these beds—near Croton Landing or Haverstraw, for example—far above the railroad tracks, but they were all formed under water.

The next event in the history was, on the contrary, a gradual rising of the land until it stood considerably higher than at present. This was followed by a sinking just as gradual, which is still in progress. Along the coast of Long Island and New Jersey tree stumps may be seen under water. It is known that these have been covered by the sea within very recent times, and that the encroachment of the sea on the land is still going on.

Many other subjects of interest are discussed in this folio, which is the most interesting contribution to New York local geology ever published. It may be purchased from the U. S. Geological Survey, Washington, D. C., for 50 cents.

The apparatus or box for developing photographic films without the aid of the dark-room, referred to in this Magazine in May, 1902, will prove of great service to explorers and travelers. The present season is the first opportunity that men in the field will have of using the machine, as it was placed on the market too late last year. With the little box, which is no larger and not so heavy as a camera, one will be able to develop one's films in the evening beside the camp fire, or if a specially fine landscape is seen which the traveler wishes to secure beyond all doubt, he may develop his snap-shot in broad daylight before moving on, provided water is at hand. The box, invented by Mr A. W. McCurdy, is known as the Kodak Developing Machine.

NATIONAL GEOGRAPHIC SOCIETY

ON May 20 the National Geographic Society moves into its new home, the Hubbard Memorial Building, which has been erected as a memorial to Hon. Gardiner Greene Hubbard, the first president of the Society, by Mrs Hubbard and her children and grandchildren. The Society has now a membership of 2,600 in the United States. Every state and territory is represented on the membership roll. After May 20 the address of the Society will be Hubbard Memorial Building, Sixteenth and M streets, Washington, D. C.

The Annual Excursion of the National Geographic Society will be on Saturday, May 9, to Annapolis, Maryland. Members and their friends will leave Washington on a special train at 9 a. m., reaching Annapolis at about 10.15. The morning will be spent in witnessing the naval drills and in inspecting the grounds. The Superintendent of the Naval Academy has very kindly detailed some members of the naval force to guide the party. Immediately after luncheon, which will be served in Carvel Hall at 12.30 p. m., Elihu F. Reiley, Esq., of Annapolis, will address the Society. He will review some of the more noted points of interest in the history of the famous old town. Three of the four signers, from Maryland, of the Declaration of Independence were residents of Annapolis. After the address the party will visit the historic scenes in the town and return to Washington late in the afternoon. The excursion committee of the Society consists of Colonel Henry F. Blount, Dr F. V. Coville, and Mr Otto J. J. Luebkert.

Dr Jean Charcot is building an ice-resisting ship at Saint Malo, France. She is to carry 17 men and to have stowage-room for two years' provisions. Dr Charcot plans to sail the middle of May for the island of Jan Mayen, and then to explore the region around Nova Zembla and Franz Josef Land. It is a summer trip only, as he hopes to be back by the first of October of this year. Capt. de Gerlache, who commanded the Belgica South Polar Expedition of 1897–'98, goes with him as the oceanographer of the party.

Mr Ellsworth Huntington, A. B., Beloit, 1897, has lately been awarded the Gill memorial by the Royal Geographical Society of London for his explorations of the Euphrates River while science teacher in Euphrates College, Harput, Turkey, 1897–1901. Since 1901, Mr Huntington has been a student in the Graduate School of Harvard University. He has just been appointed Research Assistant by the Carnegie Institution, and now goes with Professor Davis to join Professor Pumpelly for a summer of exploration in Turkestan.

GEOGRAPHIC LITERATURE

Antarctica. By Edwin Swift Balch, author of "Mountain Exploration," "Glacières or Freezing Caverns," etc. With three large maps. Pp. 230, 7 x 11 inches. Philadelphia: Allen, Lane & Scott. 1902.

The present volume presents a succinct history of south polar exploration. It is written in most entertaining style, giving a graphic account of the battles of the explorers of sixty years ago in their small sailing vessels. A volume that would unravel the tangled and imperfect records of south polar exploration has long been needed. Mr Balch's book is especially welcome because of the present interest in the far south, where four ably led and ably equipped expeditions are at work.

The author aims to particularly em-

phasize the work done by American sailors in the Antarctics. It is not generally remembered that it was an American, Lieut. Charles Wilkes, of the U. S. Navy, who first discovered the Antarctic continent, whose area is twice that of Europe. Lieutenant Wilkes, commanding the "United States Exploring Expedition" on a voyage around the world, under orders from the Secretary of the Navy, Hon. J. K. Paulding, "to penetrate within the Antarctic region," sailed from Sydney, Australia, December 26, 1839. His squadron consisted of four small sailing vessels; the sloop of war *Vincennes*, 780 tons, under his own command; the sloop of war *Peacock*, 650 tons; the gun brig *Porpoise*, 230 tons, and the pilot boat *Flying Fish*, 96 tons. None of these ships were suitable for ice work, for not one of the vessels had planking, extra fastening, or other preparations for these icy regions. The pilot boat put back soon after starting, and several weeks later the *Peacock* also was forced to return when it was found that "the ice had chafed the stem to within one inch and a half of the wood-ends of the planking." The other two vessels kept on and sailed along the Antarctic coast for some 1,500 miles, when they returned to Sydney. Lieutenant Wilkes reported to the Secretary of the Navy by letter on March 11: "It affords me much gratification to report that we have discovered a large body of land within the Antarctic Circle, which I have named the Antarctic Continent, and refer you to the report of our cruise and accompanying charts, inclosed herewith, for full information relative thereto."

As Mr. Balch well says:

"The cruise of Wilkes will remain among the remarkable voyages of all time. No finer achievement has been accomplished in the annals of the Arctic or of the Antarctic. With unsuitable, improperly equipped ships, amid icebergs, gales, snow-storms, and fogs, Wilkes followed an unknown coast line for over fifteen hundred miles, a distance exceeding in length the Ural Mountain range. It is the long distance which Wilkes traversed which makes the results of his cruise so important, for he did not merely sight the coast in one or two places, but he hugged it for such a distance as to make sure that the land was continental in dimensions. The expedition noticed appearances of land on January 13; it sighted land almost surely on January 16, from 157° 46′ east longitude, and again more positively on January 19, from 154° 30′ east longitude, 66° 20′ south latitude. On January 30 the size of the land was sufficiently ascertained to receive the name 'Antarctic Continent,' and this discovery of Wilkes is the most important discovery yet made in the Antarctic."

Impartial geographers in due time recognized the importance of Wilkes' discovery, and in recognition of his work affixed the name of Wilkes Land to the portion of the Antartic Continent along which he coasted.

In view of the great achievements of Lieutenant Wilkes, Mr Balch justly argues against the appropriateness of the suggestion of Sir Clements R. Markham, President of the Royal Geographical Society, that the Antarctic regions be divided into four quadrants, each covering ninety degrees of longitude and each named after an Englishman.

The New York State Museum has published a geologic map of New York State exhibiting the structure of the state so far as known. The map has been prepared under the direction of Frederick J. H. Merrill, State Geologist; the geographic compilation is by C. C. Vermeule, and the geologic drafting by A. M. Evans. The map may be purchased from the State Museum at Albany for $5, mounted on rollers, or for $3 in atlas form.

Office Hours: 8.30 A. M. to 5 P. M. Telephone, Main 471

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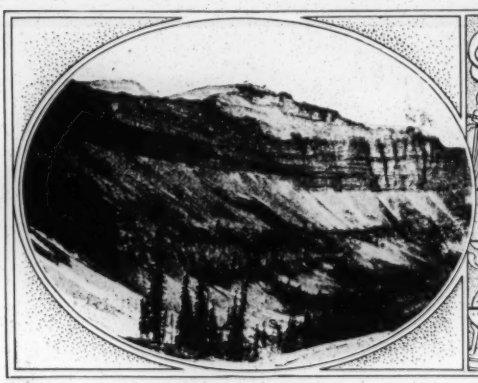

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